

FLIGHT

AN AIRCRAFT ENGINEER

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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EDITORIAL COMMENT



HE debate on the Estimates for the Royal Air Force on Thursday of last week was full of interest, not alone to those directly associated with aviation but to the general public. Facts and figures relative to our effort during the war were poured out in quick succession, each one of them more interesting than the last, although

it is true, a good many were already known. We began the War, General Seely told the House, with six squadrons and a vote of £1,000,000.

The Debate on the Air Estimates

At the conclusion of the armistice we had 200 squadrons and were spending on the Air Force at the rate of £200,000,000 a year, while our factories were producing aeroplanes equal to an output of 50,000 machines in the twelve months. In the course of the War our airmen destroyed in round numbers 8,000 enemy machines, with a loss to ourselves of 2,800. All these are of superlative interest, but we confess we are much more concerned with the future than with the records of the past, brilliant as these

latter are without doubt. We shall come to this aspect of General Seely's speech a little later.

He told the House how he had witnessed in France the first aerial combat of the War, and of how General Henderson said to him at the time that it was the beginning of a new type of battle which would grow into stupendous fights. Of how that prophecy came to be verified long before the end of the War we well know. Hardly less interesting than the story of how the actual war in the air developed was that of the scientific research and the wealth of invention which brought the aeroplane from the state of a weak, unstable machine, which even to fly at all was hazardous, to almost absolute stability and developed it from a mere scouting adjunct to the armies to a main weapon whose effect on the course of the war had become, by the beginning of last November, fair to be decisive of the vital issues of the conflict. Then, too, there is a tale of wonderful progress in connection with what we may best describe as the auxiliaries of the aeroplane and the airship. Directional wireless and the marvellous development of the wireless telephone have had a very marked bearing on the successful prosecution of the aerial war, and, we doubt not, will have an equally important part in the development of civil aviation. Not to labour too much the salient heads of progress as disclosed in General Seely's speech—which we print elsewhere—it may be said that many of the points to which he alluded seem more like extracts from a work of imagination than the sober record of established facts.

♦ ♦ ♦

The Position of Civil Aviation

But if there was much to regard with satisfaction and pride in the record of the performances of the Royal Air Force during the War, it cannot be said that General Seely's speech was devoid of points of considerably less satisfactory character than these. On the all-important question of the future of civil aviation he was more than a little vague. He agreed that the subject was one of the highest importance and that civil aviation must be accorded a generous measure of Government support, but he carefully refrained from telling the House how the Government intended to translate the conviction into a concrete policy. Beginning with the subject of the demobilisation of the R.A.F., he said quite frankly that it was a difficult problem

and appealed to employers to ease the lot of demobilised officers by finding posts for as many as possible. It seems to us that a lead in the matter of policy would be very useful here. We agree that it is impossible that the whole of the 30,000 odd officers who have been or are to be demobilised can be absorbed by civilian aviation firms, but if General Seely had disclosed the Government's programme, or given at least some clear indication of what it is likely to be, the firms concerned would be in a much better position to say how many of these demobilised officers they can probably absorb before these valuable men have drifted away to other occupations and are thus lost to aviation. According to General Seely's figures, out of the total Air Force Vote of £66,500,000, only £3,000,000 are to be devoted during the current year to civil aviation. The sum allotted to the Department of Civil Aviation is but £500,000, while £2,000,000 are to go in research and experiment, and another £500,000 in the development of new types of machines. Precisely how these sums are to be expended is not stated, so that we do not know who is to carry out the work of research and experiment, or how or by whom the new types of machines are to be developed. It therefore becomes a question of whether it has been determined that all this research and experimental work is to be the preserve of the Air Ministry and its officials, or whether the money is to be devoted to the encouragement of the private inventor and constructor for the development of promising types which are approved by unbiassed experts. If the former, then we do not see how the industry is to benefit by the vote. If the latter, well and good, but in either case it seems to us that the best ends would have been served by a definite statement of the Air Ministry's policy. As the matter stands, we are completely in the dark. It does not seem to have suggested itself to the House to manifest any curiosity in the matter, and the statement that these sums were to be earmarked for civil aviation was apparently accepted at its face value. For our own part, we are not at all satisfied with the position. We are not appealing on behalf of the industry for Government charity, but we do say that it is absolutely necessary, if the industry is to go ahead with anything approaching confidence, that there should be a clear cut line of policy, definitely laid down and published that all concerned may know what to expect. As it is, the £500,000 allocated to General Sykes' department appears to be the whole amount that will go directly to benefit civil aviation, and even that is to be expended on the organisation of what may be called the "First Aid Department." Certainly, not a penny of it will go outside the Air Ministry.

**Mail
and
Passenger
Services**

Bound up in the question of civil aviation is that of internal and overseas aerial mail services and to this subject General Seely referred all too vaguely. He was quite enthusiastic about the possibilities of carrying the mail from Cairo to India. "How best to do it, whether by carrying it by members of the R.A.F., or by putting it up to public tender, or by means of a chartered company, is a matter for consideration, though not for long delay. . . . A careful estimate has been made by a responsible officer who has been there, which shows that, in his

judgment, it would be profitable to carry the mail; and the Postmaster-General himself, having gone into the matter is enthusiastic in support of it and will co-operate in every possible way as soon as that service can be started." That is very well in its way, but we could wish it were not so vague in its characteristics. The idea of the Cairo to India aerial mail service is no new thing. On the contrary, it has been talked of and discussed for a period now running into years and it might have been thought that the Government would, by this time, have been prepared with something more than vague generalities. As *The Times* very pertinently remarks: "If this is so in the green tree, what of the dry? If, when the sap of enthusiasm is running strong in the Air Ministry the Government delay their decision for months, what chance has the Controller-General of Civil Aviation of framing an estimate of his money requirements?" *The Times* further adds: "This provisional settlement of the position of civil aviation leaves the relations of General Sykes and General Trenchard ominously vague, though General Seely maintained in his reply on the debate, that they were perfectly clear; it seems to be obstructing the opening of indispensable consultations between General Sykes' department and civilian firms; it puts, apparently, the establishment and equipment of air routes at home and abroad in the hands of the military Air Force, though it lays on General Sykes the duty of mapping them out; and it has not a word to say about the form which Government assistance to commercial aviation—declared indispensable by the Committee on Civil Aerial Transport nearly a year ago—is to take."

This is excellently expressed and it will be interesting to see what General Seely has to say in reply when the matter is put to him later on in the House, as it undoubtedly will be.

**Military
Assistance
to the
Civil Side**

It is doubtless perfectly true, as General Seely pointed out, that a great deal of assistance will be forthcoming from the military side in the development of civil aviation. Indeed, if things are properly worked and there is present among the military element a real desire to help forward the movement as a whole, there are practically no limits to the scope of that assistance. For example, there is the meteorological section, which must be of necessity a State service since it is impossible that the work can be adequately performed by private effort. It is no exaggeration to say that without such a service civil aviation would be impossible. Therefore, it is evident that the whole success of the future depends upon the facility with which the military side of the Air Ministry places at the disposal of the civil department, the whole of its data and information. Again, there is the question of the use by civilian firms and pilots of military aerodromes and landing grounds, of course at a payment to be fixed and agreed upon between the two departments concerned. Then, the military aviation authorities will have to view largely the matter of lighting and buoying the aerial channels and will have to visualise its duty more in relation to the needs of civil aviation than those of military flying.

Taking these factors, and others which will readily suggest themselves, into account, it is clear

Flight—And the Men



Brigadier-General A. HUGGINS, C.M.G., D.S.O., Deputy-Controller of Aircraft Equipment, R.A.F.

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that the £3,000,000 which General Seely told the House had been earmarked for the purposes of civilian aviation is really only a small proportion of the whole amount which will be actually available for the purposes of encouraging development. At the same time, we still think that the actual amount allocated is far too small, having in view the fact that we are on the threshold of opening up an entirely new means of transport, in which the capital expenditure is bound to be very heavy. It is quite possible that the intention of the Government is to go farther along the route of expenditure on useful development than is indicated by General Seely's statement, and it is because we have that idea in mind that we are inclined to wish that he had been more definite as to the exact intentions of the Ministry regarding the whole question of civil development. As it was, he was vague to a degree, and it is this quality of a want of definiteness that leads to uncertainty in the minds of those who are anxious and willing to get to work as soon as it is known that there is a real policy behind the generalities to which the House and the public are being treated.

Are We Really First?

General Seely told the House that this country is in the lead of the nations in aerial matters. Certainly in military strength we are first and it is doubtless the case that in scientific progress during the War we have easily led the others. But we agree with Captain Wedgwood Benn that it will at least be well if we do not accept the proposition without careful examination. It is all very well to assert that we lead, but mere assertion is scarcely concrete fact. Can we justly assume that we *do* lead when, with the exception of the few military machines that are now in the air for training purposes and the official cross-channel service, there is little flying being done in the country? Contrast this with the progress that has been made in the United States, where numbers of mail and passenger services have been developed since the end of the War. True, it is impossible to blame our own Government for the want of comparative progress. The United States as a nation has no frontiers to worry about. Its own territories are so vast and the need for inter-communication so great that it is self-contained to a degree that we can never hope to be. It has no powerful neighbours and the adjoining States are so backward in aviation that there is not even a present need of legislation to govern international air traffic. We, on the other hand, cannot allow the start of international navigation until a proper code of aerial laws has been formulated and solemnly agreed by ourselves and our neighbouring States. Therefore, it would be unwise and foolish to say that anyone is in fault because we have not the same services in operation as America is fortunate in possessing, but, at the same time, is it not equally foolish to assert without inquiry that we actually lead in both civil and military aviation? The probability is that, after the whole of the facts have been examined and compared, we actually do lead, potentially at least.

Resettlement of R.A.F. Personnel

THERE are many officers and men of the R.A.F. who are demobilised or are about to be demobilised.

In order to assist those who are undecided or are seeking advice as to their prospects in civil life, the Editor has arranged for an expert, with wide experience of service, indus-

The moment it is possible to remove the ban on civilian flying we do not doubt that we shall leave America well behind in the number and importance of our services, but we think it is well that we should avoid the outlook of smug satisfaction which is too characteristic of British officialdom. We were told before the War that we could sleep quietly in our beds, since the Navy was ready down to the uttermost detail for anything that might befall, and the country accepted the word of Ministers and believed that it *was* ready. Lord Jellicoe has now told us that the Navy was a long way from ready, thanks to the cheeseparing policy of successive Governments, and that our want of preparedness might easily have caused irreparable disaster to the Empire and its Allies. The lesson seems to us to be that we should not accept too readily these *ex parte* assertions of political heads of departments unless they are verified to the full by chapter and verse of the bases of the statement.

High Prices and Unemployment

We have before us a letter from an organisation calling itself the Peoples' Fair Play League, whose aim is reform by peaceable and constitutional methods, which contains a great deal of common-sense and is remarkable for its grip of the present situation in the Labour World. It points out—as we ourselves have done on many occasions—that one of the main root causes of existing trouble is the Excess Profits Tax, the Budget estimate for which is the enormous one of £300,000,000. By forcing up prices, the letter argues, this tax is a primary cause of dear living, discontent, unemployment and unrest. Point is given to the argument by the quotation of certain facts disclosed at the recent annual general meeting of Bovril, Limited, one of the very few concerns which has not gone in for profiteering during the war. The Chairman, it appears, pointed out to the meeting that no increase in the price of their commodity had been made during the War, and that in order to earn an additional one per cent. dividend, free of income-tax (£7,500) on their deferred shares, they would have had to increase their selling price by £53,571, of which £46,071 would have gone in Excess Profits and Income Taxes!

There is only one term that can be applied to the flagrant profiteering of the Government disclosed by these startling figures—It is a damnable scandal. Why is the Government not honest about it, and why does it not confess that it is *the* profiteer which mercilessly squeezes the people to bleed them for taxation purposes? As it is, all the odium for profiteering falls on the shoulders of the traders. It may be perfectly true that a large amount of the odium referred to is properly due to those who have made huge fortunes out of the necessities of the people, but it seems scarcely fair that the Government, which is the most wickedly shameless of them all, should escape not only without condemnation, but with actual applause for the success of its policy of raising money.

trial and educational conditions, to give advice to those who may solicit it through the medium of this Journal.

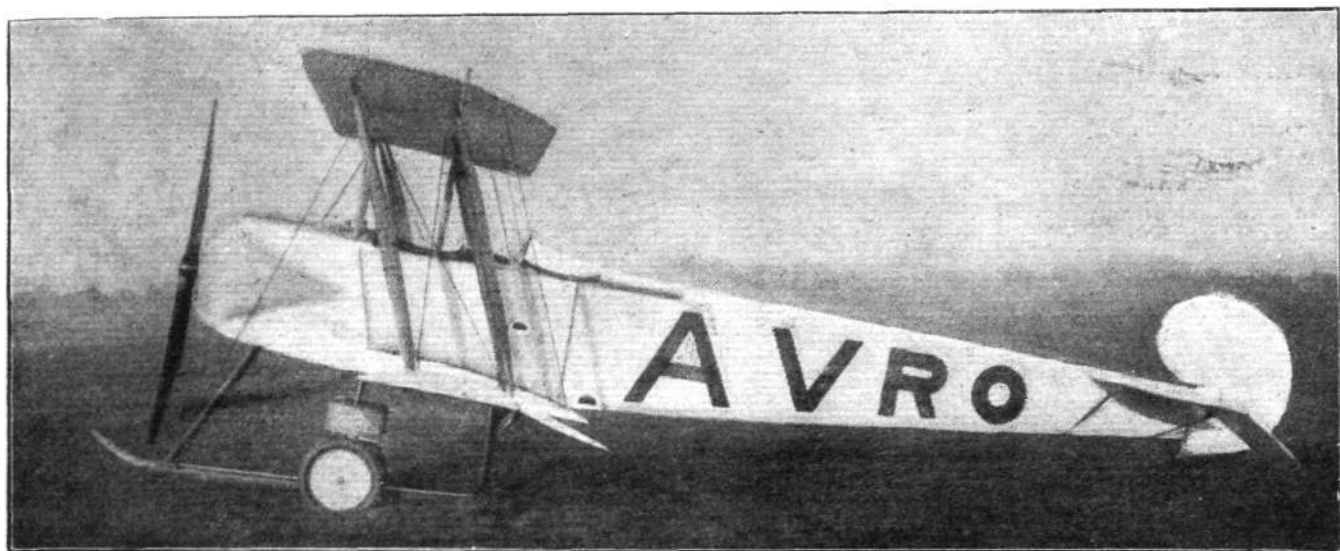
Applications, which must be in writing, should be marked *Resettlement*, and addressed to the Editor, **FLIGHT**, 36, Great Queen Street, Kingsway, W.C. 2. They will be dealt with in these columns, as far as possible, in rotation.

"MILESTONES"

The Avro Machines

IN connection with this week's instalment of our Milestones series, dealing with the Avro machines, it may be of interest to mention that it was the machines built by this firm which first suggested to us the title "Milestones." An article under this heading was published in our issue of January 8, 1915, in which were briefly described and illustrated the Avro aeroplanes from the first and up to the end of 1914. The restrictions imposed by the censorship did not permit

and there can be little doubt that the famous 80 Avro was a most remarkable machine in those days. In our issue of December 6, 1913, we published a detailed description of the machine, with scale drawings and a few constructional details, and it will not, therefore, be necessary to do more than give a photograph of it here. The machine, as already indicated, has undergone slight modifications from time to time, but these have been of a minor character, and as will be seen from the accompanying photographs of some of the



THE AVRO 504A.—This was the original machine fitted with an 80 h.p. Gnome. It was on similar machines that a raid was carried out on the Zeppelin factories at Friedrichshafen, in which Commander Briggs was brought down and captured.

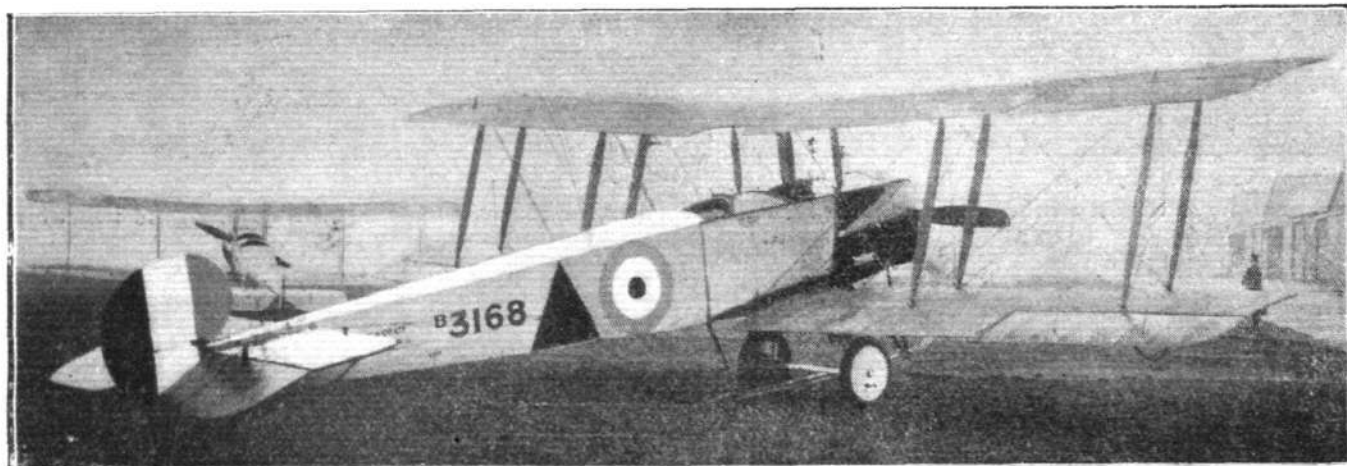
of continuing the series thus commenced, but with the present instalment on Milestones the Avro series is brought up to date, and our readers will, therefore, by looking back to the issue in question, have an unbroken series of machines ranging over a period of ten years. Needless to say there are few firms who can show such a "Family tree," having, to remain in the simile, its roots so deep down in aviation history as 1908, and with its newest branches reaching upwards into the present and near future. It is curious to note how nearly all the Avro machines retain a strong family resemblance to the earlier machines, much though they may differ in many respects. In a historical article like the present, it may not be out of the way to mention that it was Mr. A. V. Roe who pioneered the production of aeroplanes of the tractor type, a type which has proved itself superior in nearly every way to any other, and, with one or two

later models, the machine remains substantially as she was in 1913. Thus the type 504 J is to all outward appearances the same as the 1913 model, although she is fitted with a 100 h.p. Gnome monosoupape engine in place of the 80 h.p. engine of the older model. Another photograph shows the 80 h.p. tractor seaplane of 1914, the famous *Daily Mail* seaplane on which Mr. Raynham did so much good work by arousing interest in flying at various coast towns in 1914.

With this brief reference to the models in existence just before, or in the earliest days of, the War, we can now turn our attention to the machines built in the interval between 1914 and the present time.

The Type 504 K Training Machine

The modern version of the original 1913 type is known as the 504 K, and is to all intents and purposes identical with



The standard Avro type, 504J with 100 h.p. Gnome monosoupape engine.

exceptions, the designer of the famous Avro machines has remained faithful to his early ideal.

As far as concerns this article, the machine which formed the foundation of the Avro house is the 80 h.p. tractor built in 1913, and with very slight modifications still used extensively as a training machine at the present day. Surely this is a record of which any designer may well be proud,

the original. It has been strengthened up in places, it is true, and minor alterations have been made, but fundamentally the design remains unaltered. Of the alterations made, mention may be made of the engine mounting, which was, in the older machine, of the two-bearer type, the front bearer being in the form of a ball race supported on four tubular arms forming extensions of the fuselage longerons. This

"spider," as it is usually termed, has been removed in the type 504 K, and the engine is supported on two bearer plates behind the crank case—in other words, is overhung. Also the power has been increased from that of the original 80 h.p. Gnome to more modern rotaries, such as the 100 h.p. Gnome monosoupape or the 110 h.p. Le Rhone. In the table of performances printed elsewhere the figures relating to the

504 K represent the performance of the machine when fitted with a 110 h.p. Le Rhone. Any standard rotary engine up to about 100 h.p. can be fitted without entailing any alteration in the machine, adapters being supplied to suit all engines. The A.B.C. Wasp can also be fitted if desired.

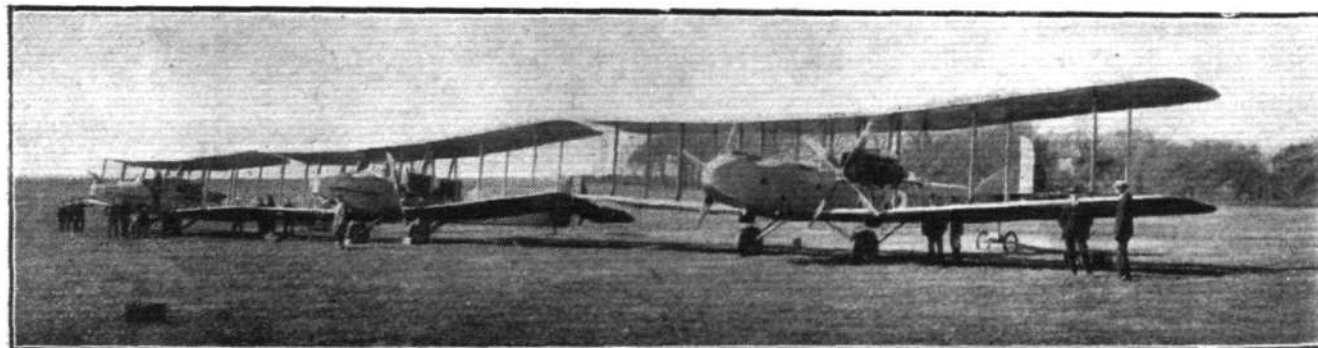
Pilots who have flown the Avro 504 K all agree that it is an extremely comfortable machine, and that on it it is



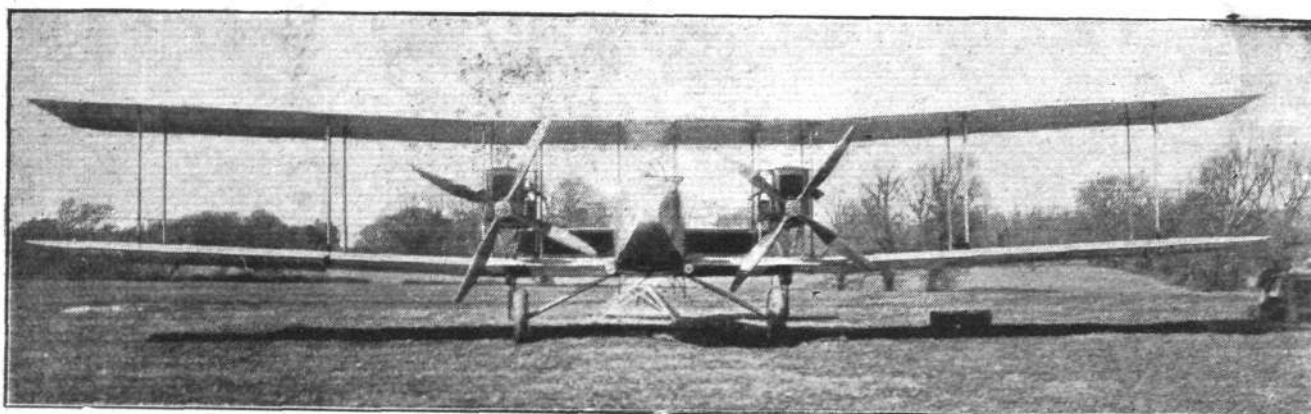
THE 80 H.P. AVRO SEAPLANE OF 1914.—This machine bears a strong family resemblance to the 504L, of which scale drawings are published elsewhere in this issue.



The Avro 504K, a slightly modified and strengthened version of the original 80 h.p. type. This machine has been adopted as the standard training aeroplane for the R.A.F.



A GROUP OF AVRO BOMBERS.—The machine farthest from the camera is the Avro "Pike" with two 160 h.p. Sunbeam engines. The machine in the centre is a sister 'plane to the "Pike" but is fitted with two 150 h.p. Green engines. The machine on the right is the type 529, with two 190 h.p. Rolls-Royce engines.



THE AVRO TYPE 529.—This machine is the same as that shown on the right in the preceding illustration. Front View.

possible to do every kind of "stunt" imaginable. The machine appears to be extremely strong in spite of its light weight, and is so easy on the controls that it is not in the least surprising to learn that it has been adopted as the standard training machine for the Royal Air Force. In this capacity it has been built in huge numbers, and it is even probable that more machines of this type have been built than of any other type in the world.

As an inexpensive touring machine for the owner-driver after the War this machine should have much to recommend it, since, even when fitted with an engine of 80 h.p. only, it has a very good performance, and the first cost, as well as the running cost, would not then be unreasonably great. As a matter of fact, we believe that the type is now undergoing further development, and that it is about to be issued in a slightly new form, probably to be known as the 504 M, in which it is arranged as a three-seater, with an enclosed cabin for the pilot and two passengers. This, however, is still a thing of the future, and no particulars can, therefore, be given at present.

It may be remembered that in 1914 the Avro firm got out a tractor seaplane, 150 h.p. Sunbeam engine, for the circuit of Britain. Although the outbreak of War prevented the running of this race, this particular type of machine was proceeded with, and several were built early in 1915. The time between the outbreak of hostilities and May, 1916, was taken up with the construction, in addition to the standard 504, of 130 h.p. Clerget two-seaters, 130 h.p. Sunbeam two-seater seaplanes, and several large single-engine bombers. The 504 was slightly altered in various respects for different jobs. Then in May, 1916, tests were carried out on a twin-engine bomber.

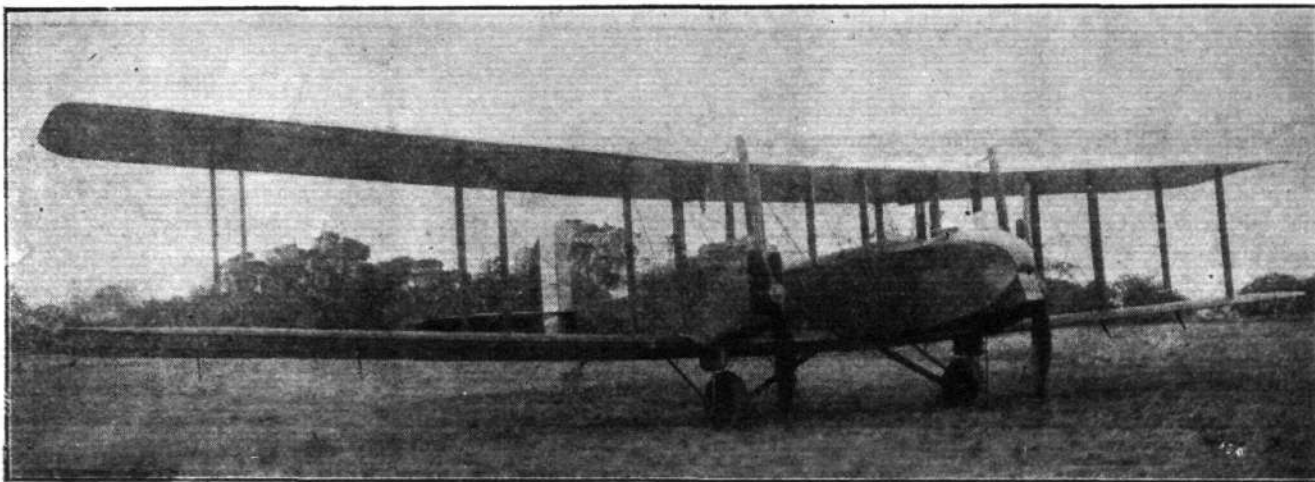
The Avro "Pike." May, 1916

This machine was the first Avro twin-engine machine to be built, and was intended for work as a three-seater fighter. The general arrangement will be clear from the accompanying diagrams. The pilot occupied the middle seat, while a gunner was placed in the nose of the fuselage, and one well aft, about half-way between the planes and the tail. From the tables it will be seen that the "Pike" had a very good performance, considering that she only had a total h.p. of 320, the power plant consisting of two Sunbeam engines each of 160 h.p. In plan the machine was very similar to the standard single-engine Avros, with rectangular planes and tail, with the corners rounded off. The machine had an adjustable tail, rotatable gun rings, and bomb racks. The pusher airscrews were carried on extension shafts from the engines, and rotated in opposite directions. Considering the time of testing the first machine, May, 1916, and the good performance for its power, it is not immediately obvious why the type was not at once put into production, but the fact remains that it was not, immediately or at any time. The solution does not emerge from the table of performances, which would certainly appear to justify its production in quantities.

Contemporary with the "Pike," another machine, which was really her sister plane, was going through the works. This machine was, however, fitted with two Green engines of 150 h.p. each. Also the airscrews were tractors instead of pushers. This machine was tested in August, 1916. A third machine on very similar lines, but totally different in detail design, was fitted with two Rolls-Royce engines of 190 h.p. each. This was known as the 529 type, and was first tested in April, 1917. One of the accompanying photo-



THE AVRO TYPE 530.—This is a two-seater fighter, fitted with a 200 h.p. Sunbeam Arab engine. It was originally designed for a 300 h.p. Hispano, which could not, however, be obtained at the time of testing the machine.



THE AVRO TYPE 529A.—This is a sister 'plane to the type 529, but has two Galloway B.H.P. engines.

graphs shows these three machines lined up, the one on the left being the "Pike," that in the middle the Green engined machine, and the one nearest the camera the 529.

The next machine to be tested was the

Avro Two-Seater Fighter, Type 530. July, 1917.

In many ways the 530 was a radical departure from usual Avro practice. Thus the engine, instead of the rotaries fitted in the type 504 machines, was a water-cooled—a 200 h.p. Sunbeam "Arab." Also the shape of the wing tips was totally different from the usual Avro rectangular tips with rounded corners. As regards the fuselage, this was very much deeper, and of different shape altogether from the ordinary Avro bodies. The object kept in view when designing this machine was to provide as good a view as possible for both gunner and pilot. To this end the body was made very deep, and the pilot was so placed that his eyes were on a level with the under side of the top plane. Similarly the gunner was placed very high in relation to the top plane, being in fact able to fire over it. It will be noticed that the attachment of the top plane to the body was unusual. A sort of fin was extended up from the body, covered with ply-wood, to which the centre section was attached. Inside this fin was mounted the pilot's machine gun, synchronised, of course, while the gunner's weapon was mounted on the usual rotatable gun ring. The undercarriage was of a simple Vee type, but forming a letter M, as seen from in front, and the two side Vees were enclosed in fabric. The machine was very light and quick on the controls, and the deep roomy fuselage afforded ample space for ammunition, wireless, cameras, etc. From the table of performances it will be seen that both speed and climb were very good indeed for the power, and this is of particular interest in view of the comparatively large cross sectional area of the fuselage—14 sq. ft.—which does not appear to have adversely affected the speed of the machine. Originally the Type 530 was designed for a 300 h.p. Hispano-Suiza engine, but as this could not be obtained the experi-

mental machines were fitted with 200 h.p. Sunbeam "Arabs" and 200 h.p. Hispano-Suizas.

The Three-Seater Bomber, Type 529A. October, 1917.

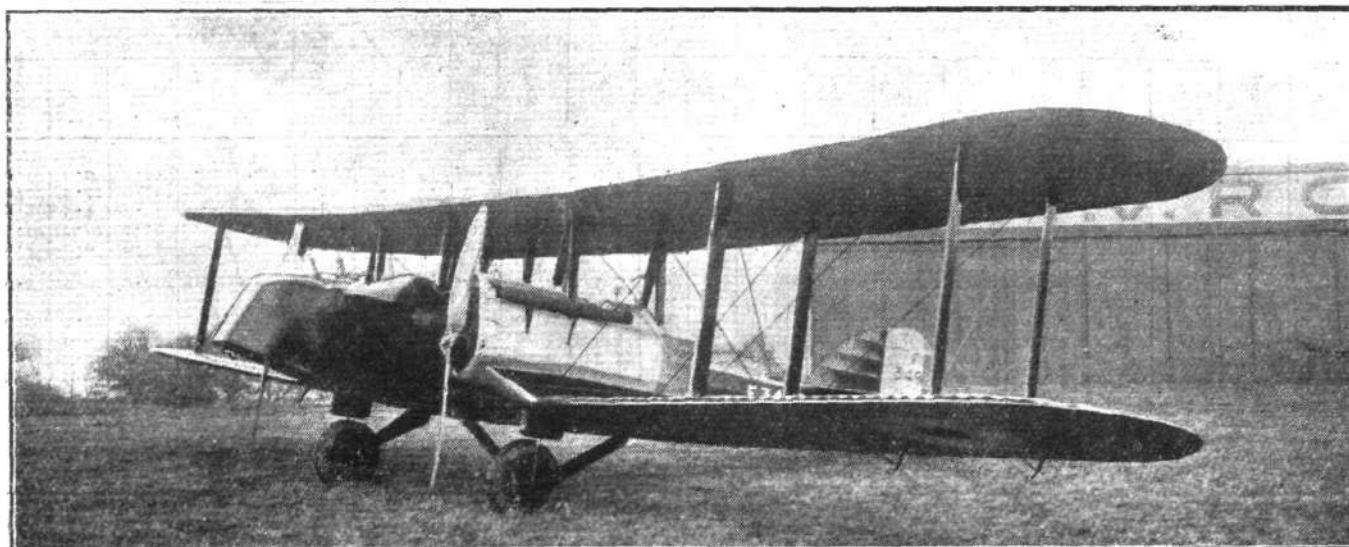
The reason for the apparent break in the series, by which the two-seater fighter, type 530, comes before the 529A, is to be found in the fact that these two machines were going through the works at the same time, and the type 530 was finished a short time before the other machine. The type 529A is a sister plane to the Rolls-Royce engined machine. From the table of performances it will be seen that both speed and climb of this machine were very good indeed, while at the same time she had a good range of action (556 miles at 10,000 ft.). She would therefore have made a good long-distance bomber, and should have been coming through in quantities in the spring and early summer of 1918. From the plan view of the machine it will be seen that the wings were arranged so as to be capable of being folded back, thus economising storage room. The pilot sat just ahead of the leading edge of the planes, while a gunner was placed in the nose of the fuselage, and another gunner well aft, whence he had a good field for his machine gun. The engines fitted were Galloway B.H.Ps., of 220 h.p. each. As shown in the illustrations the engines were very neatly covered in, and drove tractor screws, running in the same direction.

The Avro "Spider," Type 531. April, 1918.

The following spring saw an entirely different type of machine issue from the Avro works. This was a single-seater "Scout," in which the wing bracing was along quite unusual lines. From the illustrations it will be seen that, instead of the ordinary wing bracing wires or cables, the "Spider," as this machine was called, had Vee struts arranged in the form of a Warren truss. It may be remembered that in 1917 we published in *FLIGHT* a series of articles by "Marco Polo," entitled "Wing Bracing and Head Resistance," in which this particular form of wing bracing was dealt with.



THE AVRO "SPIDER."—Note the unusual strutting arrangement.



THE AVRO MANCHESTER, Mark II.—Was fitted with two 250 h.p. Siddeley "Puma" engines.

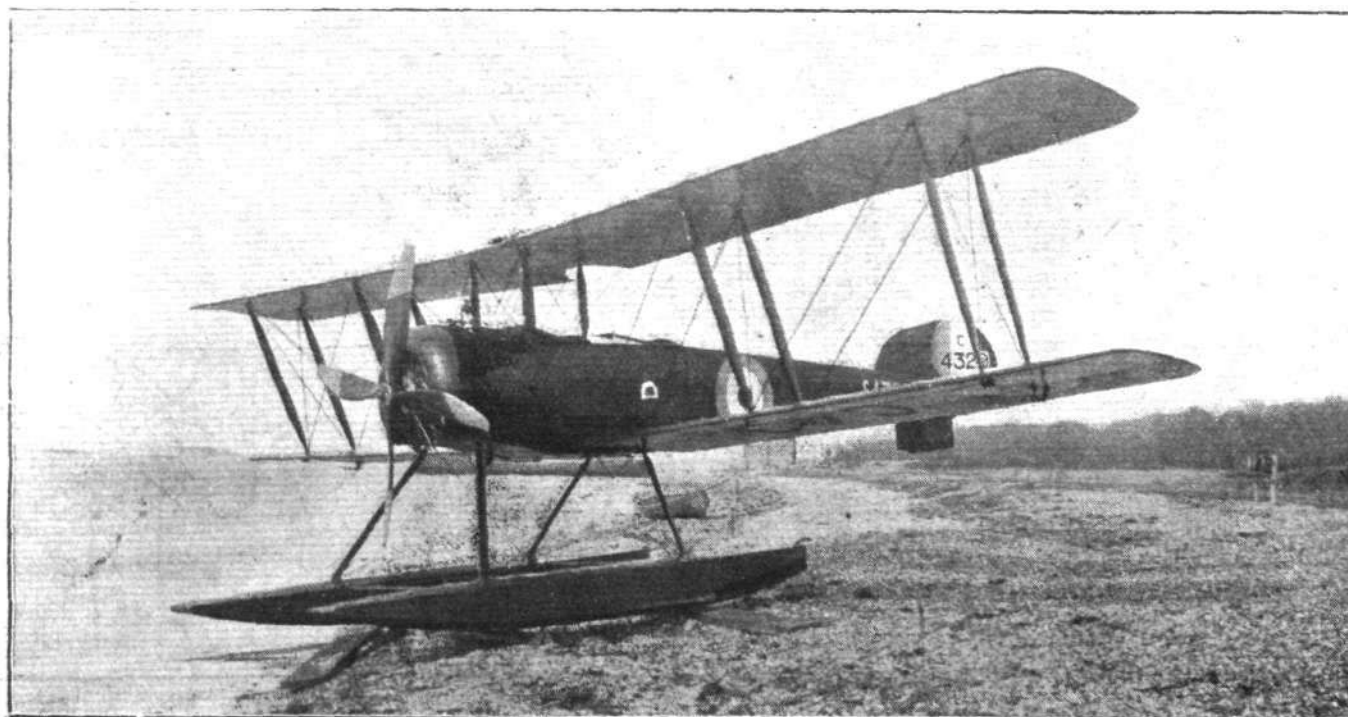
In this article the author expressed the opinion that although the combination of Nieuport Vee struts and Warren truss did not appear to give the absolute minimum of resistance, it did have a low resistance, while at the same time having the structural advantage that the distance between supports was reduced, thus resulting in a lighter structure, and that therefore the arrangement might be found to be worth trying.

This appears to be what the Avro designer has done, and we may therefore be pardoned a certain special interest in this particular machine. We understand that the "Spider" was extremely manœuvrable and light on the controls, and the accompanying table of performance indicates that the machine had quite a good turn of speed—120 m.p.h. at ground level with a 130-h.p. Clerget engine is not bad—while the climb was also satisfactory. The pilot was so placed that his eyes were on a level with the top plane, in which a circular opening was cut out. This gave a good view both upwards and horizontally in all directions, while the small chord of the bottom plane gave a minimum of obstruction to downward visibility. The "Spider" might conceivably make a good sporting model, especially if fitted with a somewhat smaller engine, since the petrol bill for a motor of 130 h.p. would probably be more than the majority of owners would care to spend. However, as the machine is light there does not appear to be any reason why, in a slightly modified form, it should not be fitted with, say, an engine of 80 h.p. or thereabouts.

The Avro "Manchesters." December, 1918.

The success which was attained with the earlier model twin-engined machines, from the point of view of performance, encouraged the Avro firm to get out a design for a modern machine of this type, to be an improvement upon previous models chiefly as regards its engines, which were to be of the A.B.C. Dragonfly type, which was by then—we are now speaking of the earlier part of 1918—beginning to go into production, and which had an extraordinary power/weight ratio. With such engines available a very good performance was anticipated, and the drawings for the "Manchester" Mark I were got out. However, it was found that after all the engines could not be obtained, and so a slightly modified form of machine was designed—the "Manchester" Mark II—which was fitted with two Siddeley "Puma" engines, instead of the two Dragonfly engines originally contemplated. The "Manchester" II was put through its tests in December, 1918, and gave, as indicated in the tables, very good results in the way of speed and climb. As shown in the illustrations, the two types of "Manchesters" are very similar, except, of course, as regards the engine housings. As in the previous Avro twins, the pilot occupies the middle seat, with one gunner in front and one in the rear. A feature which will scarcely escape the notice of readers is the unusual arrangement whereby the *ailerons* are balanced. Instead of the ordinary small forward projection at the outer end of the *aileron*, now so frequently seen on large machines,

(Continued on page 367.)

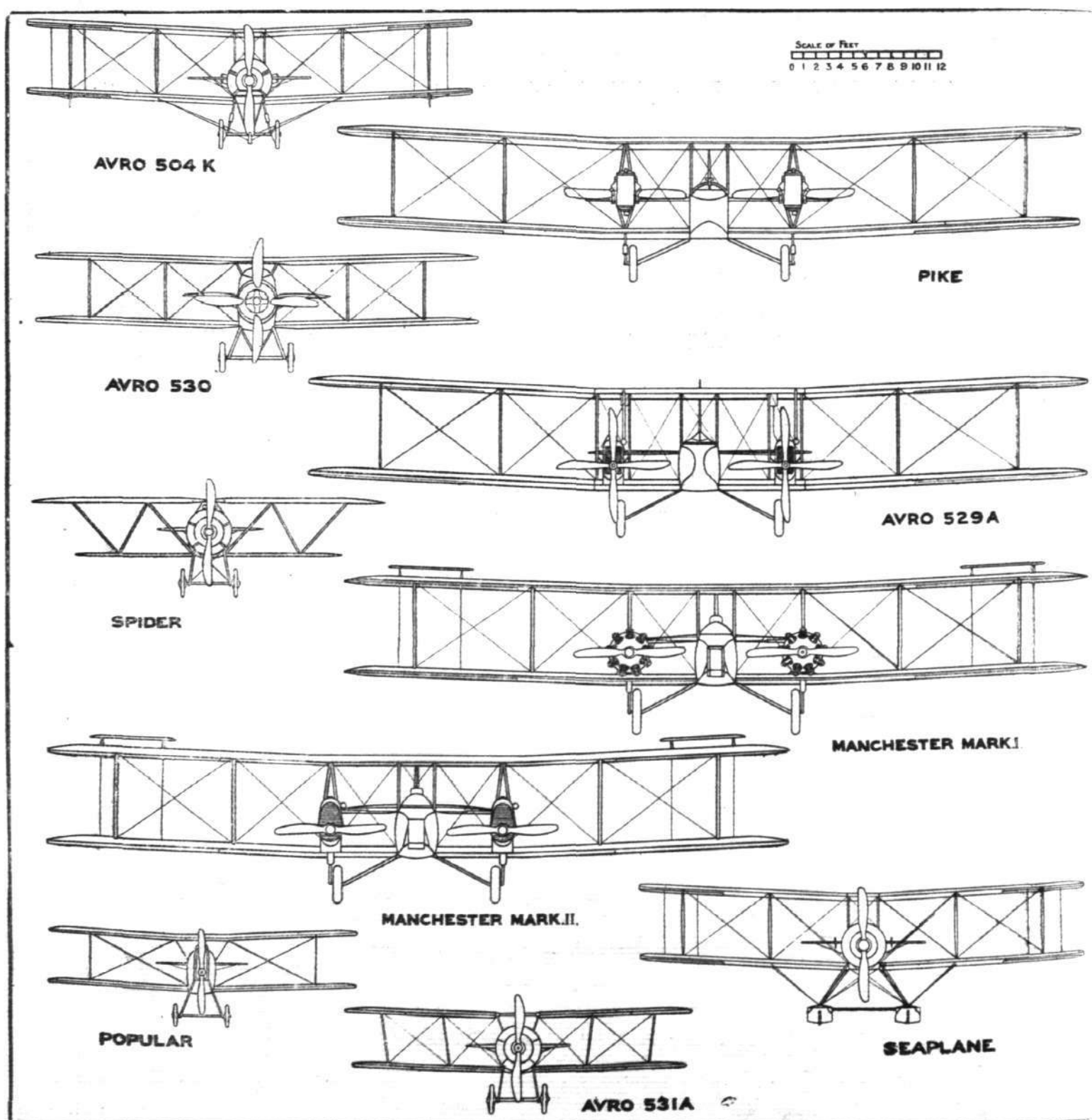


The Avro Seaplane, Type 504 L.

Table of dimensions of Avro machines.

Type of machine.	Length o.a.	Wing span.		Wing chord.		Wing area.*			Inci- dence.		Gap.	Stagger.	Sweepback.	Dihedral.		Aileron area.	Area.			Area.		
		Top.	Bot.	Top.	Bot.	Top.	Bot.	Total.	Top.	Bot.				Top.	Bot.		Tail- plane.	Elevators.	Total.	Fin.	Rudder.	Total.
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	square feet.			°	°	ft. in.	ft. in.	°	°	°	sq. ft.	square feet.			square feet.		
504K	28 11	36 0	36 0	4 10	4 10	171.5	158.5	330.0	4.5	4.5	5 6	2 2	0	2.5	2.5	45.5	26.0	18.0	44.0	0.0	9.0	9.0
"Pike"	39 1	60 0	60 0	7 0	7 0	418.0	397.0	815.0	4.0	4.0	7 3	0 0	0	3.5	3.5	122.0	80.0	45.0	125.0	17.5	21.0	38.5
530	28 6	36 0	36 0	5 6	5 6	182.0	164.0	346.0	2.0	2.0	5 0	1 9	0	1.5	1.5	58.0	28.4	23.8	52.2	4.5	8.8	13.3
529A	39 8	64 1	64 1	7 6	7 6	465.0	445.0	910.0	2.0	2.0	7 3	0 0	0	3.0	3.0	128.8	48.4	36.8	85.2	10.0	24.5	34.5
"Spider"	20 6	28 6	21 6	6 0	2 6	162.0	46.0	208.0	0.0	0.0	4 2 1/2	2 0	0	0.0	0.0	22.0	15.2	10.4	25.6	0.0	7.8	7.8
Man- chester I	37 0	60 0	60 0	7 6	7 6	430.0	383.0	813.0	4.0	4.0	7 3	0 0	0	2.5	2.5	124.0	69.0	38.0	107.0	16.0	18.0	34.0
Man- chester II	37 0	60 0	60 0	7 6	7 6	430.0	387.0	817.0	4.0	4.0	7 3	0 0	0	2.5	2.5	124.0	50.0	35.0	85.0	12.0	16.0	28.0
504L	32 1	36 0	36 0	4 10	4 10	170.0	160.0	330.0	4.5	4.5	5 6	2 2	0	2.5	2.5	45.5	26.0	18.0	44.0	6.0	9.0	15.0
531A	20 6	28 0	27 0	4 6	4 6	106.0	104.0	210.0	1.5	1.5	4 3	2 0	0	2.0	2.0	29.2	17.5	11.0	28.5	0.0	7.8	7.8
"Popular"	17 3	25 0	25 0	4 0	4 0	98.0	82.0	180.0	3.5	3.5	4 0	1 4	0	3.0	3.0	27.0	9.5	8.5	18.0	0.0	9.0	9.0

* Including ailerons.



Front Elevations of the Avro Machines.

(Continued from page 365.)

the "Manchesters" have a small auxiliary plane mounted on two short struts from the main aileron, and placed slightly ahead of it, so as to produce a balancing effect. The advantages expected from this arrangement are probably structural rather than aerodynamic, since by doing it in this fashion the twist of the aileron leading edge, caused by the usual balance placed at the extreme end of the aileron, is avoided. We believe that in some recent German machines a similar arrangement has been tried, but differing in that the small auxiliary plane is below the main plane instead of above it as in the Avros.

More recently we believe the Dragonfly engines have been obtained, and the "Manchester" Mark I tried with them as originally intended, with good results. We understand that the "Manchester" II is being fitted with a cabin for passenger and mail carrying, and probably, therefore, more will be heard of this machine later on.

The Seaplane, type 504L. February, 1919.

Quite recently, last month in fact, a further development of the famous 504 type has taken place. This takes the form of a tractor seaplane with 130 h.p. Clerget engine, very similar to the standard Avro 504 in general arrangement, except, of

Table of weights, etc., and performance of Avro machines.

Type of machine.	Engine.		Weight of machine.		Fuel capacity.	Range (in miles).*	Speed (m.p.h.).			Climb (in mins.) to			Ceiling.	Landing speed.	Load/sq. ft.	Load/h.p.	Military load.
	Type.	H.P.	(empty) lbs.	(loaded) lbs.	hours		Ground level.	10,000.	15,000.	5,000.	10,000.	20,000.					
504K ..	Le Rh.	110	1,230	1,823	3	225	90	75	65	6.25	16	65		35	5.52	16.5	
Pike (523) ..	2 S.	320	4,000	6,064	7	616	97	88		9.5	27			40	7.3	15.9	
530 ..	H.S.	200	1,685	2,680	4	432	118	108		6	14	40†	18,000	45	8.23	13.4	214
429A ..	2-B.H.P.	440	4,361	7,135	5.25	556	116	106	93	7	17.5	35‡		45	7.75	16.2	1,280
Spider (531) ..	C.	130	963	1,517	3	330	120	110		4	9.5	22‡	19,000	40	7.78	11.6	125
Manchester I ..	2-D.	640	4,079	6,586	5.75	700	128	122	115	4.5	11	40	20,000	45	8.06	10.3	
Manchester II ..	2-P.	600	4,574	7,158	3.75	446	125	119	112.5	6.5	11.5	43§	17,000	45	8.76	11.9	1,074
504L ..	C.	130	1,408	2,006	2	160	80	65		8.5	22.5			40	6.09	18.2	
531A ..	C.	130	963	1,514	3	330	120	110.5	103	4	9.5	22‡	19,000	40	7.22	11.6	
Popular (534) ..	G.	35	607.5	844.5	3.5	217	70	67	62*	20				30	4.69	24.1	

Le Rh. = Le Rhone.

S. = Sunbeam.

H.S. = Hispano-Suiza.

C. = Clerget.

D. = "Dragonfly" A.B.C.

P. = Siddeley "Puma." G. = Green.

* At 10,000 ft.

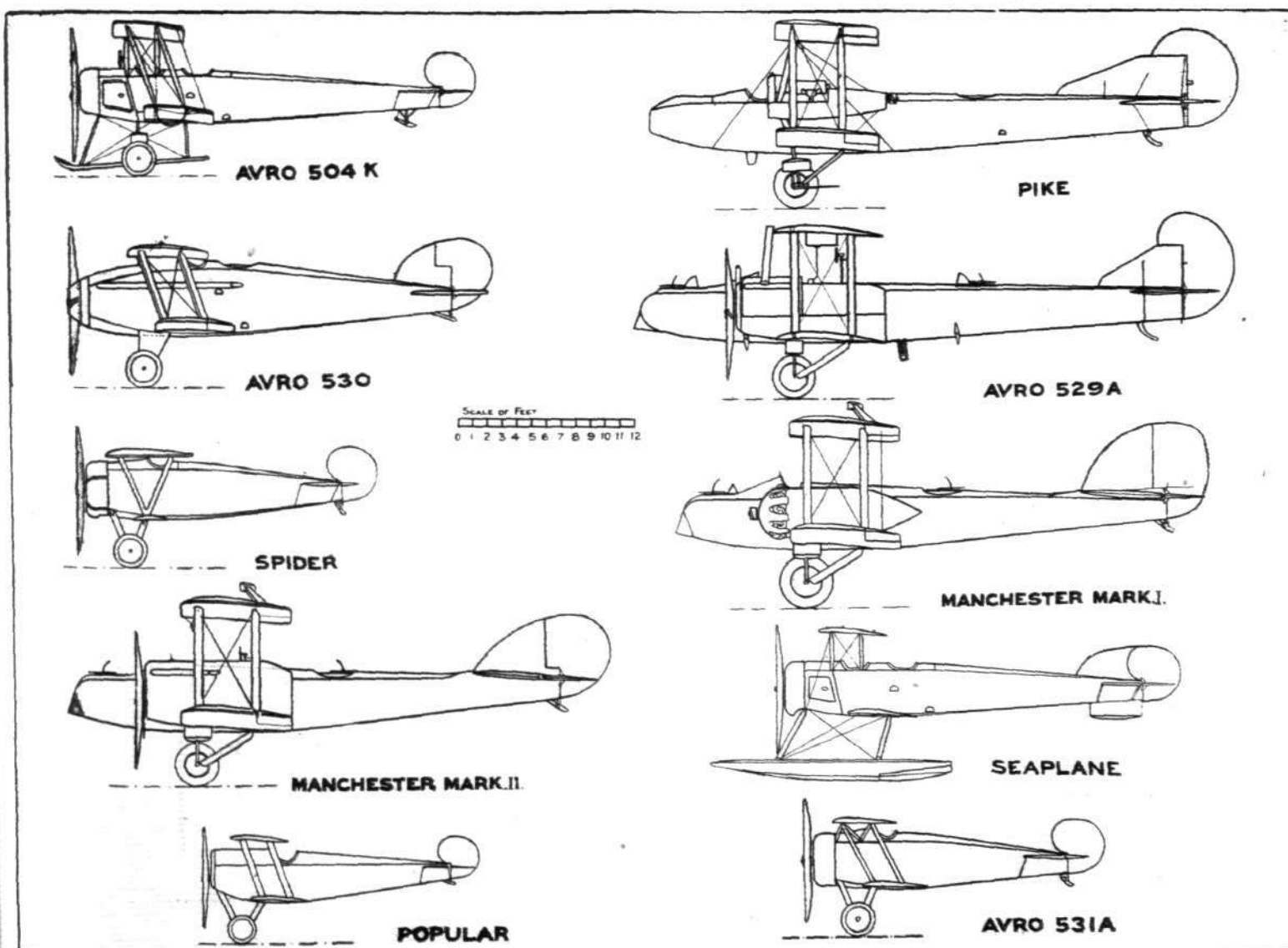
† To 18,000.

‡ To 15,000.

§ To 17,000.

|| At 3,000.

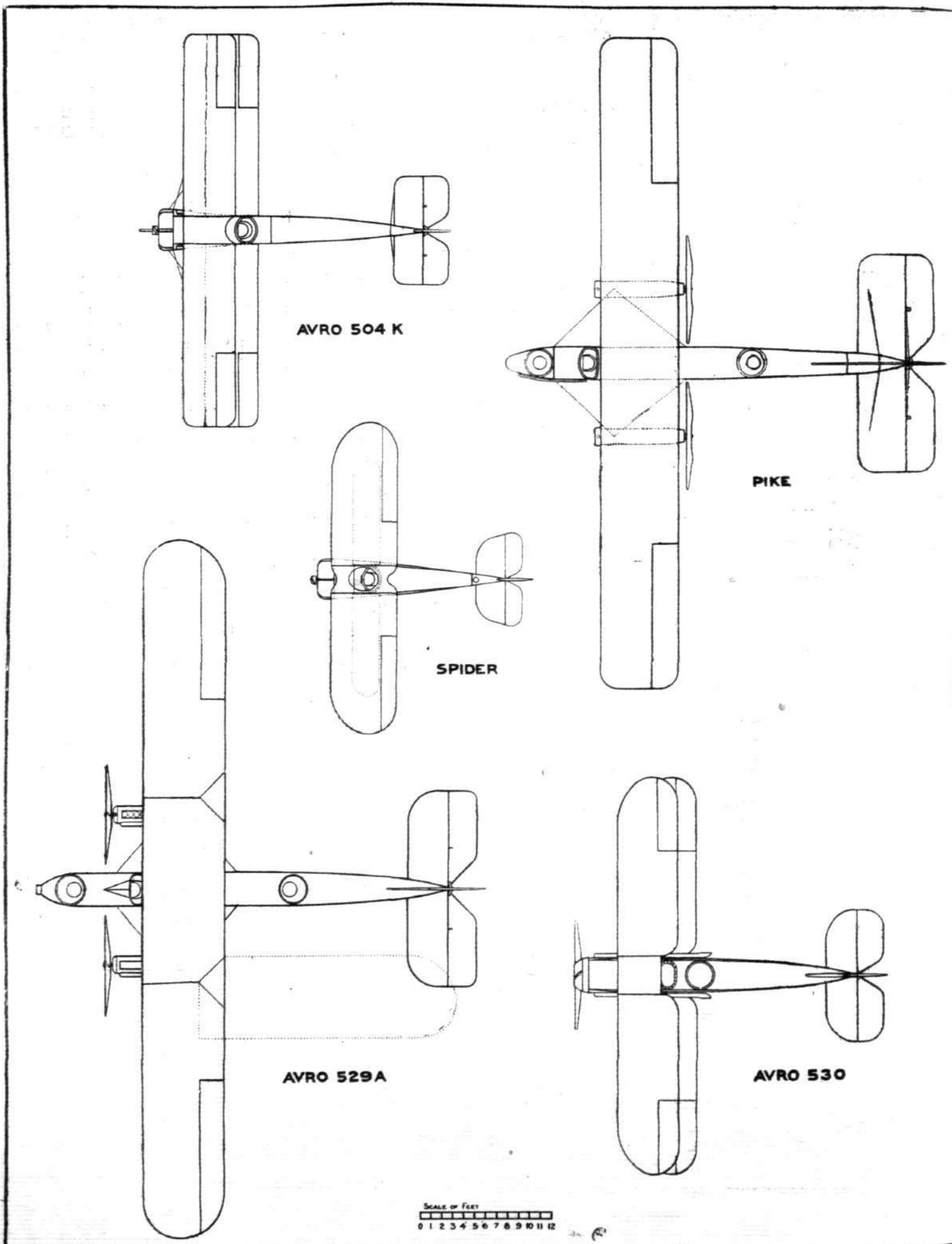
¶ At 5,000.



Side Elevations of the Avro Machines.

course, the undercarriage, which is of the twin-float type. This machine is known as the 504L, and is not greatly different from the 1914 type of seaplane illustrated at the beginning of this article. The figures in the table of performances, relating to this machine, are the calculated figures, and we are informed that the actual tests have given even better results.

Thus the calculated speed was, as shown in the table, 80 m.p.h. at sea level, whereas the machine actually does 90 m.p.h. The machine, which is fitted with dual controls, can be looped, spun, side-slipped, stalled, etc., just like the standard land machines. The 504L will also be arranged as a three-seater, with single controls and the pilot in front. The airscrew



Plan Views of some of the Avro Machines.

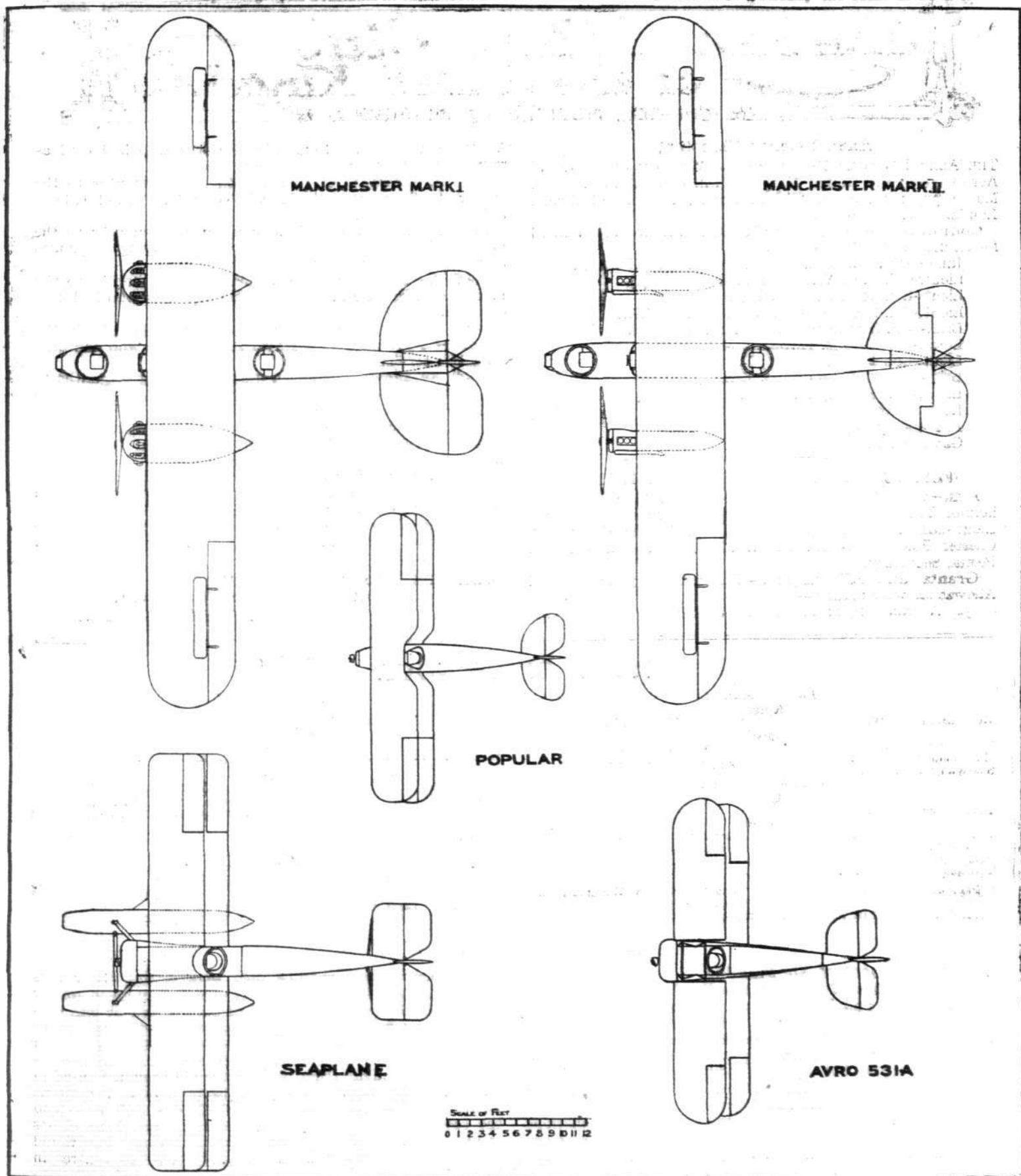
shown in the photograph, and which was used for the test, has Avro patent detachable blades. Finally, it might be mentioned that the machine will take all rotaries up to 150 h.p. and also the A.B.C. Wasp.

The Avro "Popular," type 534

This machine is designed for use as a solo machine at flying schools, and is intended to form a step between the two-seater school machines and the higher powered service machines. It should also be quite a useful 'bus for a low-priced sporting model, as its cost and upkeep should not be prohibitive. At the moment of writing the machine has not been actually tested, and so the figures are those calculated for the machine, but they will probably not be far wrong. We regret that there are no photographs available of this machine.

The Fighting Scout, type 531A.

This machine is of the ultra-modern scout type, with two pairs of inter-plane struts on each side, and with the centre section struts slightly raked outwards. The centre section in the top plane has been left open, in the manner of the Sopwith Dolphin, and the pilot is so placed that his head is in the rear portion of, and slightly below, this opening, so that his view is interrupted to a small extent only. Generally speaking, the machine follows usual Avro practice, in the shape of its body and other main components, such as the semi-circular balanced rudder, etc. The figures relating to its performance are estimated, and are practically identical with those relating to the "Spider," which has, it will be remembered, the same engine power—a 130 h.p. Clerget. As the total wing area is practically the same in both these



machines—differing only in the disposition of the area of top and bottom planes respectively—this affords an interesting comparison between the standard type of machine with two pairs of struts on each side and the Warren-cum-Nieuport type of bracing, accompanied, of course, by a large area top plane and a small area bottom plane. According to the figures given there is little to choose between the two forms, but the "Spider" type may be thought to give the better visibility of the two.

It may be pointed out that the figures of performance

given in the table are estimated, the machine not having been flown at the time of writing this article. It is, however due to be tested almost any day now, and we hope shortly to be able to publish a photograph of it.

Previous instalments in this series appeared as follows:—
Airco (De H.) machines, January 9, 1919; Bristol machines, January 23, 1919; Sopwith machines, February 6, 1919. All the scale diagrams of the "Milestones" series are to a uniform scale, and are thus immediately comparable as regards relative size.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Annual General Meeting

THE Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Monday, March 31, 1919, at 3, Clifford Street, New Bond Street, London, W. 1, at 6 p.m.

Committee.—The following Members have been nominated for election to the Committee:—

James Bird (late Squadron Commander, R.N.A.S.).
 Lieut.-Col. C. de W. Crookshank (late R.E.).
 Lieut.-Col. John D. Dunville, R.A.F.
 Lieut.-Col. Spenser D. A. Grey, D.S.O., R.A.F.
 Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S.
 Lieut.-Col. T. O'B. Hubbard, M.C., R.A.F.
 Lieut.-Col. F. K. McClean, R.A.F.
 Brig.-Gen. E. M. Maitland, D.S.O., R.A.F.
 Lieut.-Col. Alec Ogilvie, R.A.F.
 Lord Northcliffe.
 F. Handley Page.
 Gavin W. Ralston.

FLYING SERVICES FUND COMMITTEE

A Meeting of the Flying Services Fund Committee was held on Thursday, the 13th inst., when there were present:—
 Lieut.-Col. T. O'B. Hubbard, R.A.F., in the Chair, Mr. Chester Fox, Brig.-Gen. R. H. More, C.M.G., and H. E. Perrin, Secretary.

Grants and Allowances.—The following Grants and Allowances were made:—

(32) A grant of £111s. to the widow of an ex-1st Class

Air-Mechanic in the Royal Flying Corps who had died as result of exposure whilst on active service.

(40) An allowance of £2 a month for six months to the widow of a Sergeant in the Royal Flying Corps who had been killed on active service.

(66) An allowance of £1 a month for six months to the mother of a Flight-Sergeant in the Royal Flying Corps who had been killed on active service.

(145) An allowance of £4 a month for six months to the mother of a Private in the Royal Flying Corps who had died on active service.

(157) An allowance of £2 a month for six months to the widow of a Private in the Royal Flying Corps who had died on active service.

(158) An allowance of £4 a quarter for twelve months to the grandmother of a Sergeant in the Royal Air Force who had been killed on active service.

(159) An allowance of £2 a month for six months to the mother of a 2nd Class Air-Mechanic in the Royal Flying Corps who had been killed on active service.

(163) A grant of £10 and an allowance of £4 a month for six months to the widow of a Flight-Sergeant in the Royal Air Force who had died on active service.

(164) An allowance of £4 a month for six months to the mother of a Private in the Royal Air Force who had died on active service.

Offices: THE ROYAL AERO CLUB,

3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

ROLL OF HONOUR

Published March 13

Killed

Reid, Sec. Lieut. W.

Died

Simmons, Lieut. A. D.

Ellis, Lieut. T. A.
 Hammond, Lieut. V. J.
 Sharman, Lieut. C. L.

Died

Thompson, Lieut. S.
 Thurston, Capt. D. R.

Published March 14.

Killed

Forder, Lieut. E. G.

Died

Lawrence, Capt. P. W. B.
 Thomson, Lieut. J.
 Toller, Lieut. R. A.

Findlay, Sec. Lieut. F.
 Harker, Capt. H. R.
 John, Capt. F. E.
 Kavenagh, Sec. Lieut. C. F.

Previously reported Missing, now reported Died of Wounds as a Prisoner in German hands

Pollard, Sec. Lieut. G. H. (Arg. and Suth'd Highrs.).

Accidentally Killed

Downe, Lieut. C. L., Aust. Flying Corps.

Published March 15

Killed

Hackett, Lieut. L. A.

Hancock, Lieut. J. M.

Died

Chaney, Maj. H. E.
 Martin, Lieut. B.
 McNeaney, Capt. J. H.
 Porter, Sec. Lieut. W.
 Stoye, Lieut. A. R.

Todd, Sec. Lieut. L. G.
 Vickers, Capt. S. W., M.C., D.F.C.
 Whitelaw, Sec. Lieut. F. J.

REPATRIATED.

The following R.A.F. officers have been repatriated:—

Atkinson, Lieut. J. M.
 Meakin, Sec. Lieut. G. E. R.
 Reeves, Lieut. W. A.

Robinson, Capt. W. E.
 Smith, Lieut. S.
 Tooke, Capt. B. C.

The Development of Air Fighting

In the course of an address to the Association of Foremen Engineers and Draughtsmen at Glasgow on March 15, Lord Weir said that in the early days of the War machines were either entirely unarmed or the pilots carried a service rifle or revolver. The first fight in the air took place in September, 1914, but by the middle of 1915 air fighting had become a recognised feature, and increased rapidly thereafter. The original tendency was for single-handed combats between different patrols, but finally formations of from 80 to 100 machines took part. The armament used had been the Vickers-Lewis gun, and the rate of fire had increased from 600 to 1,000 rounds.

Just before the Armistice they were getting the results of a very long series of experiments with guns of much greater calibre, which fired shell instead of bullets, and he was convinced that a further year's development would have brought about the initiation of a type of battleship of the air rather than a single-seated machine; in fact, another twelve months would have brought them back to the old argument used in naval matters about destroyers, battleships and cruisers. It was no secret that arrangements had been made to extend the scope of the Air Force this winter, and those efforts would not have been confined to the Rhine, but would have affected every industrial and political centre in Germany.

COEFFICIENT NOMENCLATURE IN AERODYNAMICS

By C. H. POWELL, B.Sc.

Diversity of Coefficients

IN spite of the advance in the science of Aerodynamics, there is still a great diversity in the form of presenting experimental results not only in different countries, or in different establishments in any one country, but in single establishments also.

It appears necessary, therefore, that some standard form should be adopted for moment and force coefficients.

The following notes contain a few suggestions to this end.

The available units for use are disposed in three systems which are now in general use in their own particular spheres. They are as follows:—

	I.	II.	III.
Area	sq. feet	sq. feet	sq. metres
Speed	miles/hr.	ft./sec.	metres/sec.
Length	feet	feet	metres
Force	lbs.	lbs.	kgms.

The first has two different units for a length, viz., miles and feet; this alone should condemn it. Further the Aerodynamic Coefficients come out very small in actual value, and are therefore clumsy to use and more difficult to memorise.

The other two are consistent in themselves as far as fundamental units are concerned.

Air Resistance of Objects

A common way of expressing an aerodynamic force on an object or body, has been:—

Force = KAV^2 Where A = an area pertaining to the body.

V = speed.

K = coefficient.

This coefficient K has two great faults:—

1. It has to be altered every time the density of the atmosphere is altered, as, for example, in considerations of the effect of altitude.

2. It has to be altered every time a change is made from lbs. ft. sec. units to kgm. metre sec. units, i.e., it is not a pure number.

In view of the fact that forces and moments can be expressed in the form of coefficients without these faults, it would seem common sense to adopt such a form universally.

These ideal coefficients are the well-known "absolute coefficients," and they are in use not only in laboratory work, but also in the designing departments of a large percentage of firms designing their own machines.

Absolute Coefficients

The fundamental form of expression of an aerodynamic force in a body or an object is:—

Force = $F_c \rho A V^2$, where F_c = the absolute force coefficient.

A = area sq. ft. or m.² pertaining to the body in question,

and ρ is the density represented by the number of a special kind of mass units in a unit of volume. One mass unit of this kind is the mass of 32.2 lbs. wt. or 9.81 kgms. wt., as the case may be.

As F_c is independent of all the physical factors contributing to an aerodynamic force, it is unaffected by any change in the system of units, and is therefore a pure number depending only on the shape, attitude and aspect of the body.

Dimensions.—The value of ρ in lbs. ft. sec. units for air at sea level at 760 mm. barometer and 15° C. is .00237. In metric units under same conditions $\rho = .125$ or $\frac{1}{8}$.

So the value of F_c being given, we can compute the actual force directly either in lbs. or kgms. Thus:—

Lbs. = $(F_c) (.00237)$ (sq. feet) (ft./sec.)²

Kgms. = $(F_c) (.125)$ (sq. metres) (metres/sec.)²

The absolute coefficient F_c has the same value in each case. This is because F_c is non-dimensional, i.e., it is a number pure and simple.

Conversely a force derived from experiment in lbs. or kgms. as weighed by an aerodynamic balance can be put into the form of an absolute coefficient in a similar manner.

In using the experimental results of M. Eiffel's researches for calculations in lbs. ft. sec. units it is quickest first of all to convert to absolute units by multiplying by 8 (i.e., $\frac{1}{\rho}$) and then to use the absolute coefficient so found in the usual way as described above.

Other Forms of Absolute Coefficients

The expression of Moments, Pressures, Powers, etc., is readily effected by an extension of the foregoing, having regard to the fact that the coefficient must always be non-dimensional. Thus:—

Moment = $M_c \rho A V^2 l$ M_c = abs. mom. coeff.

ρ = density "mass units"/unit vol.

A = area

V = speed

l = a linear dimension of the body such as the wing chord.

Positive and Negative Directions of Forces and Moments

In problems of stability it is convenient to have the resolution of the resultant force along axes fixed in the body. Opinions are divided as to which directions shall be considered positive.

Fig. 1 and the following table show the scheme adopted at the N.P.L. The case considered is that of a complete aeroplane.

Longitudinal force represented by X positive to the rear.

Lateral force represented by Y positive to pilot's left.

Normal force represented by Z positive upward when in normal flight.

Rolling Moment force represented by L positive from Y axis to Z axis.

Pitching force represented by M positive from Z axis to X axis.

Yawing force represented by N positive from X axis to Y axis.

All arrows in Fig. 1 point in a + direction.

As a considerable amount of experimental work has been expressed in the above form, it is hoped that it will remain the standard notation.

Definition of Lift and Drag

Lift is the component of the resultant force resolved perpendicularly to the relative wind; in the case of an aeroplane, it acts against gravity when the machine is in horizontal flight.

Drag is the direct resistance component of the resultant force, i.e., the component resolved along the direction of the relative wind. It is thus necessarily perpendicular to lift. There can therefore never be a negative drag, though it may be noted in passing that frequently cases are found in which a longitudinal force X is negative. A yacht sailing close to the wind is an example.

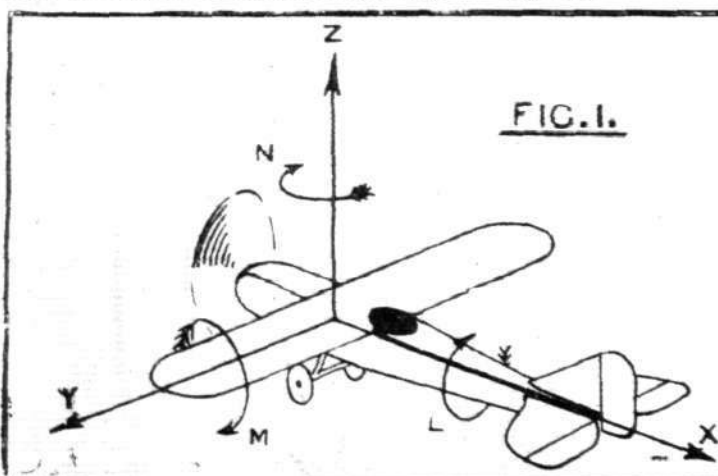


FIG. 1.

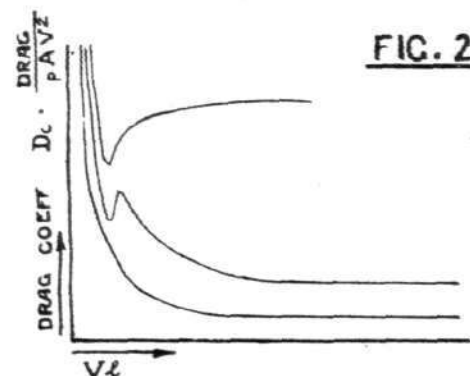


FIG. 2.

C. H. POWELL.

Lettering of Coefficients.

As to the actual lettering of absolute coefficients, it appears impossible to avoid a compound of two letters, one large and one as a suffix. We have the choice between K , K_a , K_m , etc., and L , D , M , etc. Now the most important letters are of course the l , d , m , etc., denoting what the coefficient stands for, and not the K or c , which merely stands for coefficient.

This presents a very strong case for L , D , M , etc. Further, it has been found in actual practice that the suffix letters of K , etc., being so small are much more liable in printing or typing to get left out, leaving the bare K , whereas if the c is left out of L , the consequences of such a mistake are not nearly so disastrous. Times out of number has the K been mistaken for K_c and misprinted as such, thereby entailing considerable confusion. It must be admitted by all clear-minded people that anything tending to add to confusion should be avoided at all cost. The complete scheme of absolute coefficients in use in the practical application of aerodynamic research is appended below:—

Lift..	..	Coeff. $L_c = \frac{L}{\rho AV^2}$	L = lift	English	Metric
				in lbs.	or kgrms.
Common drag (a)	..	$D_c = \frac{D}{\rho AV^2}$	D = drag	"	"
Airship Envelope drag (b)	..	$D_c' = \frac{D}{\rho C \frac{2}{3} V^4}$	C = vol. of envelope	cu. ft.	m. ³
Resultant force	..	$R_c = \frac{R}{\rho AV^2}$	R = result. force	lbs.	kgrms.
Longitudinal force	..	$X_c = \frac{X}{\rho AV^2}$	X = longit. force	"	"
Lateral force	..	$Y_c = \frac{Y}{\rho AV^2}$	Y = lat. force	"	"
Normal	..	$Z_c = \frac{Z}{\rho AV^2}$	Z = nor.	"	"
Rolling moment	..	$L_c = \frac{L}{\rho AV^2 l}$	L = roll. mom.	lbs. ft.	kgrm. metres.
Pitching	..	$M_c = \frac{M}{\rho AV^2 l}$	M = pitching	"	"
Yawing	..	$N_c = \frac{N}{\rho AV^2 l}$	N = yawing	"	"
Pressure	..	$P_c = \frac{P}{\rho V^2}$	P = pressure	lbs./sq. ft.	kgrm./sq. m.
Aircrew thrust (a)	..	$T_c = \frac{T}{\rho V^2 D^2}$	T = thrust	lbs.	kgrms.
Aircrew thrust (b)	..	$T_c' = \frac{T}{\rho n^2 D^4}$	T =	"	"
Aircrew thrust (c)	..	$T_c'' = \frac{T n^2}{\rho V^4}$	T =	"	"
Aircrew Torque (a)	..	$Q_c = \frac{Q}{\rho D^3 V^2}$	Q = torque	lbs. ft.	kgrm. metres.
Aircrew torque (b)	..	$Q_c' = \frac{Q}{\rho D^5 n^2}$			
Aircrew torque (c)	..	$Q_c'' = \frac{Q n^2}{\rho V^5}$			
Aircrew power (a)	..	$H_c = \frac{H}{\rho V^3 D^2}$	H = power	ft. lbs. /sec.	metre kgs./sec.
Aircrew power (b)	..	$H_c' = \frac{H}{\rho n^3 D^5}$	H = horse power	550	metric h.p. 75
Aircrew power (c)	..	$H_c'' = \frac{H n^2}{\rho V^5}$			

If H_c represents the engine power coefficient and η the aircrew efficiency then ηH_c represents the aircrew power coefficient.

It will be noticed that L occurs twice. The letters, LMN for moments were, it is believed, first used by Euler, and have long been in use in rigid dynamics. L has also been in use to denote lift since very early days of aerodynamics. It is therefore necessary to use different forms of L . In printing the selection of heavy type for Lift presents no difficulty. In typing the following suggestion is made:—

If a small "l" be superposed directly on capital "L" on a typewriter it will be found that an L is made with a double upright stroke. This is particularly easy to write or type, and is recommended as the easiest solution of the difficulty.

How such a distinction could be made in the K system is difficult to imagine.

The Representation of Drag.

In Aerodynamic calculations the objects or bodies subjected to air reaction separate out into two distinct classes:—

1. Those whose function is to provide a lifting force.
2. Those whose function is to contain some necessary part of the aeroplane such as an engine or a pilot. It is desirable that both kinds carry out their allotted functions with the least possible resistance.

Taking the second class of object. These are those which contribute to "parasitic" resistance. The best method of establishing the drag coefficients is based on that of M. Eiffel, viz., that in which the drag is referred to the projected area normal to the relative wind when the object or body is in normal symmetrical aspect. For example:—

$$\text{Drag} = D_c \rho a V^2 \quad D_c = \text{abs. drag coeff.}$$

ρ = density "mass units"/unit vol.
 a = projected area normal to relative wind direction.
 V = speed.

Once determined " a " of course remains the same whatever attitude the body may ultimately adopt, e.g., it does not take on a new value for any variation in angle of incidence.

In estimating up the total drag in calculating the performance of an aeroplane, it will be found most convenient to sum up first in tabular form all the products of $D_c a$ of the individual parts such as wheels, struts, etc., contributing to the parasitic resistance.

For a single seater high-powered machine of clean design $D_c a$ may have a value of the order of 3.5 or thereabouts.

It is approximately proportional to the square of the linear dimensions of machines and inversely as the cleanness of design. This latter quality might be defined in terms of $D_c a$ and the size of the machine. The actual "parasitic drag" can then be found by multiplying the sum of all the products $D_c a$ by ρV^2 . This method is better and quicker than computing each drag separately at some arbitrary speed, as is sometimes done. Similar treatment applies to wings and control surfaces where drags are referred to superficial areas " A " instead of projected area " a ." These drag coefficients will in general be lower in actual value than those described above.

Plotting Out Coefficients from Laboratory Results.

Owing to the effect of viscosity it is known that the drag of models at slow speed does not vary exactly as the square of the speed. Anyone engaged on computing the performance of an aeroplane naturally requires full scale values only.

If " ν " be the kinematic coefficient of viscosity = .000159 at 15° C., " V " the speed, and if " l " be a linear dimension, it may be deduced from the work of Reynolds, Rayleigh,

Buckingham and others that for every value of $\frac{Vl}{\nu}$ there is a certain definite "shape" of air flow round the body peculiar to that value, and that further the drag coefficient as defined above has a definite corresponding value.

A large number of laboratory experiments have been devoted to finding the variation of the value of the drag coefficient with different values of $\frac{Vl}{\nu}$. In most ordinary

work the value of ν is taken as constant, and it is sufficient and more convenient to plot the drag coefficient on a base Vl as in Fig. 2, which indicates three common forms of such curves. Low resistance forms usually show no kink in the curve, whereas some high resistance forms may show even two. In any case it seems that where a kink occurs it is almost certainly due to the amalgamation of two entirely different functions representing two entirely different types of flow. The value of $\frac{Vl}{\nu}$ where the amalgamation occurs is called the critical value. If l and ν be fixed in any series of experiments, then there will be a critical value of V . Conversely, if V and ν be fixed and the size of object varied, then there will be a critical size of object.

At low values of Vl the drag coefficient approaches infinity, since it is referred to V^2 , whereas the actual drag is nearly all due to viscosity and varies almost directly as V .

It is found that the curve ultimately becomes horizontal with an increase in values of Vl , indicating that the effect of viscosity becomes ultimately negligible and that the resistance now varying as V^2 is due almost entirely to the momentum effect of shifting the air bodily. It is the object in aerodynamic research to obtain as high values of Vl for each object or body investigated and to obtain the value of the drag coefficient at full scale and high speed, by extrapolation if necessary. Abs. drag coefficients range in value from about .035 for the best shape of fusiform body to about .77 for a long rectangular plate.

It is futile to express resistance of any kind according to a law involving fractional indices such as—

Resistance = KV^n where n = a fraction between 1 and 2.

as this value of n is gradually and continually changing as V increases.

The ultimate drag coefficients, *i.e.*, those obtained when resistance is varying as V^2 , are now known fairly accurately for most forms of bodies, and the coefficient for any new form of body can be estimated by a consideration of these. A similar method of plotting is applied to wing research, although there is much more research work waiting to be done on wings than there is on body resistances.

Plotting Out Laboratory Results on Airscrews.

The older methods of plotting were to plot thrust and torque coefficients on a slip base. This has almost entirely been replaced by plotting them on a base $\frac{V}{nD}$ when V = translational speed of airscrew through the air, n the revolutions per second, and D the diameter of airscrew.

When the value of $\frac{V}{nD}$ is fixed the angle of incidence of the relative wind to any section of the blade is also fixed, and so the thrust and torque coefficients will likewise be fixed, subject to variations due to viscosity, which, on account of the relatively high speed of the blades through the air as compared to other objects, may be neglected for all practical purposes.

At first sight it appears immaterial whether the coefficients be plotted on a base $\frac{V}{nD}$ or $\frac{nD}{V}$. The list of coefficients indicate that there are three different types of coefficients, each for thrust torque and power, and it is here intended to indicate the best base on which to plot them. Taking for example thrust coefficient (b) $T_c' = \frac{\text{thrust}}{\rho n^2 D^4}$.

Suppose n and D be fixed while V is varied, then T_c' will be proportional to thrust, $\frac{V}{nD}$ will be proportional to V .

Therefore if T_c' be plotted against $\frac{V}{nD}$ the curve will show how thrust varies with velocity, other things remaining the same.

Now take $T_c = \frac{\text{thrust}}{\rho V^2 D^4}$, if V and D be kept the same while n be varied, then the true connection between thrust and revolutions, other things being unaltered, will be represented

by a curve T_c plotted on a base of $\frac{nD}{V}$ and not $\frac{V}{nD}$ as has been done frequently. The plotting of T_c on a $\frac{V}{nD}$ base and T_c' on $\frac{nD}{V}$ is meaningless.

Similarly $T_c'' = \frac{\text{thrust}/n^2}{\rho V^4}$ should be plotted on $\frac{nD}{V}$ base, as it then shows variation of thrust with diameter when the speed ratio is constant.

The same reasoning applies of course to the torque and power coefficients.

Sometimes it is found convenient in performance calculations to plot airscrew results on $\frac{V}{np}$ base instead of $\frac{V}{nD}$, where p = experimental mean pitch of the airscrew, *i.e.*, $p = \frac{V}{n}$, when the airscrew has no thrust and is merely "floating." As regards methods of plotting the coefficients, what has been said with regard to $\frac{V}{nD}$ corresponds also with $\frac{V}{np}$. The coefficients, however, are still referred to D not p . It may be noted that most airscrews have their maximum efficiency at $\frac{V}{np} = .75$ approximate.

Summary of Recommendations.

1. Universal use of absolute coefficients.
2. Adoption of standard body axes in accordance with N.P.L. practice.
3. Adoption of L_c lettering in preference to K_c .
4. Adoption of thick type L for Lift in printing and double stroke L for typing.
5. T for Thrust, Q for torque, D for dia. and p for pitch of an airscrew. P for pressure. H for power, n for revs. per sec., XYZ forces along body axes, LMN moments round corresponding body axes.

T_c, T_c', T_c'' notation for the three kinds of airscrew coefficients.

6. That fractional indices as n in V^n be abolished for all work even in so-called skin friction experiments.

7. In airscrew work to plot:—

$T_c, Q_c, H_c, \eta H_c$ on $\frac{nD}{V}$ base.

$T_c', Q_c', H_c', \eta H_c'$ on $\frac{V}{nD}$ base.

$T_c'', Q_c'', H_c'', \eta H_c''$ on $\frac{nD}{V}$ base.

A Sopwith Entry for "Daily Mail" Prize

THERE is now another British competitor for the *Daily Mail* trans-Atlantic prize, a Sopwith machine having been entered by Mr. R. O. Cary, managing director of the Sopwith Aviation Co., Ltd., on Tuesday. The biplane, which will be piloted by Mr. H. G. Hawker, accompanied by Lieut.-Comdr. Mackenzie Grieve, R.N., as navigator, is of 46 ft. 6 in. span, and is fitted with a 375 h.p. Rolls-Royce "Eagle" engine. The special features include a 400-gallon petrol tank, which it is estimated will hold enough for a 25-hours' flight, and the arrangement of the top of the fuselage to form a lifeboat, when detached. Mr. Hawker, with Commander Grieve, in a trial recently covered 900 miles in 9 hrs. 5 min.

Mr. Hawker, Commander Grieve and the machine left Liverpool on March 18 for Newfoundland. They propose to leave St. John's at 4 p.m. (American time) one afternoon and hope to land at Brooklands at 4 p.m. (English time) the next afternoon, a flying time of 19½ hours.

The R.A.F. Paris-London Mail

It is authoritatively stated that the R.A.F. Paris-London mail and passenger service has been very successful. Though confined to the carrying of urgent official mails, and passengers on business in connection with the Peace Conference, it has also served as a medium for obtaining data and experience, which will prove of great value in the near future, for establishing regular mail and passenger services for civilian purposes. The R.A.F. detachment carrying out this work, officially known as No. 2 Communication Flight, is situated a few miles outside Paris. The machines used are Handley Pages and D.H.4's.

Each morning a weather report is telephoned from England, as well as from the meteorological station in France, and as a result of this the orderly pilot telephones to the Headquarters of the British Peace Commission and states whether flying is feasible and whether it is desirable to dispatch mails or passengers. If the report is favourable the mails and any passengers are at once sent out to the aerodrome by car, the machines usually setting off about 9 a.m. If the weather is unfit for flying no time is lost by this arrangement, and the mails are dispatched by the morning boat train.

The departure of each machine is telephoned to London, and when the plane arrives at Hendon a King's messenger is waiting to take the mail bag direct to Whitehall. The average time taken for the trip is 2¼ hours, while the "record" is 1 hour 50 min. This was set up by a pilot who made the two-way journey in 3 hours 50 min.

Some Distinguished Passengers

As showing the saving of time effected it may be noted that on March 16, Mr. Bonar Law was in conference with the Prime Minister in Paris at 10.30 a.m. An hour later he left Paris on a D.H. 4, landed at Hendon at 1.55 p.m., and at 2.15 p.m. was in his study in Downing Street.

Gen. Seeley on Saturday flew from Folkestone to Paris in the fast time of 1 h. 14 min. for the 172 miles.

On Wednesday last Mr. J. H. Thomas, M.P., availed himself of a Handley-Page machine to go to Paris in order to discuss the industrial trouble with the Prime Minister, while Mr. H. B. G. Larkin, of the Commonwealth Government line of steamers, went by the air way to Paris to confer with Mr. W. M. Hughes, the Australian Prime Minister.



FOLLOWING the publication here of items of damage by aircraft inflicted upon us by the Huns, some German official statistics have also become available of the punishment inflicted in return by the Allies over German territory. From August, 1914, to November 6, 1918, material damage to the extent of about £1,675,000 was effected, 729 persons being killed and 1,754 injured. Somehow these figures are not convincing, and we should not be surprised to find them amended before long. What another three months' of bombing would have brought about for the Germans in the same direction, may well be left to the imagination, knowing what we know of the arrangements which by the middle of November were due to mature.

SOUNDS a bit fantastic to be bringing salmon to London from Aberdeen by a regular air service! It may be the aim of the promoters, as suggested in a morning contemporary, to capture thereby the business in the best class of fish, but we fancy the added cost to the salmon would hardly attract queues of would-be purchasers even of this—at present—very shy fish. No we'll wait a bit longer in the hope that our local purveyor may catch a decent fish which has lost its coupon before the season's over. Added railway freightage is quite enough for us.

THERE must be a good deal of hard thinking going on Belfast way, as to the best way out for disposing of the 40,000,000 yards or so of aeroplane cloth, which it is estimated will be on hand by the end of the month. With the cost of linen soaring at its present price, few traders care to commit themselves to a speculative purchase. It will probably be found necessary to let it loose in the market by degrees, as at present to cover cost nothing much under 7s. per yard retail would be of any use. With better Government encouragement of civil aviation, no doubt a good deal of the stock could be absorbed, but under present conditions it looks as if Belfast spinning factories were in for a slump in employment—less the out-of-work donation payments which will have to be contributed by the Government.

LAST week the passing of the captured Hun planes, which have been on exhibition in St. James's Park, came about

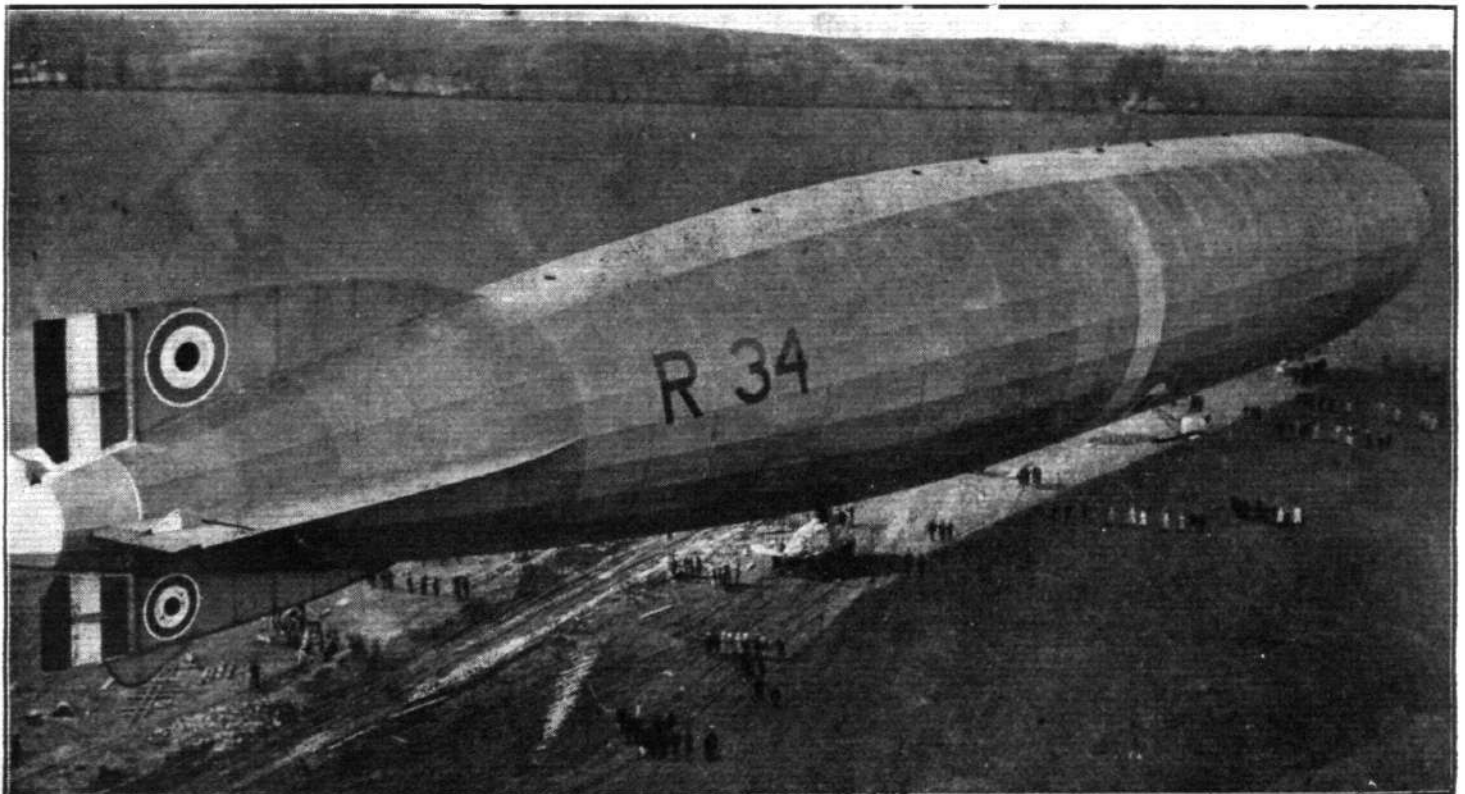
by the dismantling and carting away of these craft in motor lorries.

SUCH fooling as the suggested duel in the air near Paris, between Flight-Capt. Schreiber and another flyer by name Vaudecrane, should not be tolerated. It has certainly since been "called off" and may only have been by way of a stunt advertisement. But with seconds duly appointed, it might well be that the intention was really serious, and that a fight to the death with machine guns might have materialised. Such happenings would be anything but a beneficial advertisement for aviation whatever it might be for the survivor, if there was one. It would be from France that such a proposition could emanate.

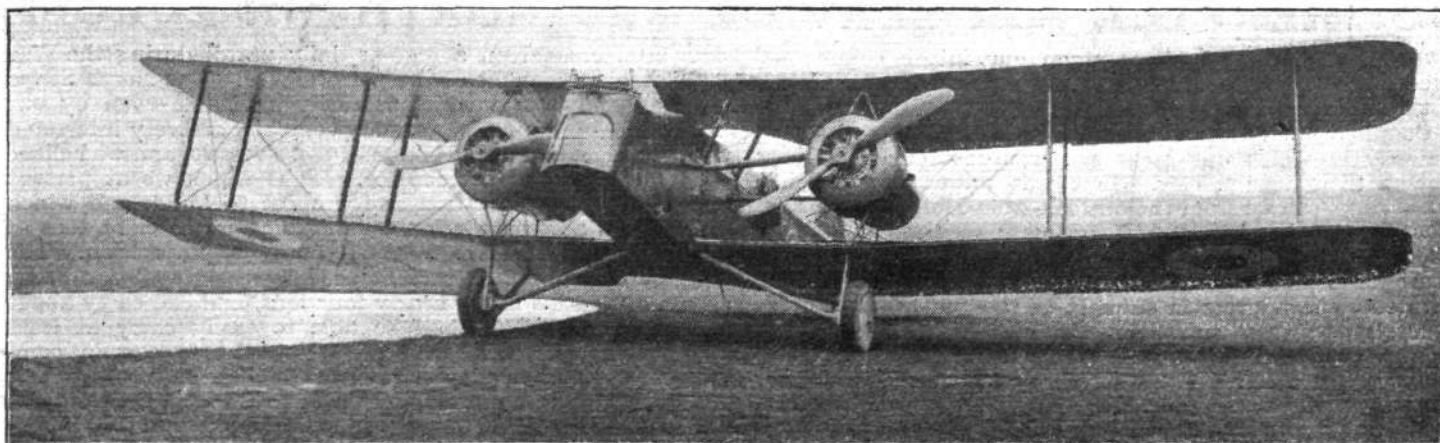
THE official veto which apparently is placed upon individual effort in perpetuating the memory of some loved one who has suffered the extreme penalty in this War may have some good fundamental reason as a justifiable basis. But to the uninitiated it certainly does seem at first glance a harsh enactment. Surely it is a beautiful sentiment which finds solace in the erection of a monument, in the case of an aerial squadron commander, in the form of a cross in marble fashioned after the dead officer's propeller, which his comrades had erected over their beloved chief's resting-place. Yet the carrying-out of this last sign of respect, is denied the parents of the dead commander, judging by a Parliamentary reply upon the subject. The only design allowed is that sanctioned by the Imperial War Graves Commission. And the pity of it.

PROBABLY by way of a small sample, against the day he uses the 'plane for his work, Dr. Fridtjof Nansen, the explorer, the other day took a trip to Paris in one of the Handley-Page machines.

THE announcement that Australia's aerial survey party has reached the first stage of the trans-continental route, Charleville, due west of Brisbane, in Central Queensland, is a token of much moment to the world of aviation. It is significant of the hold which the art of flying has reached on the public that this highly significant item of news should



THE LATEST BRITISH RIGID.—The "R 34" had its trial outing last Friday, March 14, at Inchinnan. Built by Messrs. Wm. Beardmore and Co., Ltd., this mammoth airship is slightly larger than its sister craft "R 33," launched the other day at Selby, otherwise "R 34" is practically of the same type as "R 33." Our view gives a good idea of the vessel as seen partly from above.



THE BOULTON AND PAUL "BOURGES."—This interesting machine was just going into production when the Armistice came. It is a three-seater and can be used for a variety of War purposes, while in a somewhat altered form it has great possibilities as a peace-time aeroplane. In the photograph the machine is fitted with two B.R. 2 rotatory engines, but later types are driven by two A.B.C. "Dragonfly" engines. The performance of the Bourges is excellent, and she is particularly easy on the controls, being in fact capable of evolutions which have hitherto been considered chiefly the domain of smaller machines.

be tucked away in under three lines of type in about two newspapers.

EVERYONE remembers Stephenson's "bad for the coo" tale as a result of violent contact with his train. In the case of an aeroplane containing two American soldiers reported from France, which recently fell upon a train travelling in the direction of Chaumont, it was apparently equally bad for the train, as although the aviators were badly crumpled up, one of the railway coaches was derailed and other consequences resulted, according to the report of the occurrence.

A MILD but not unreasonable grumble comes from "N.C.O. Pilot," writing from Nottingham. Our correspondent's case of grievance is as follows:—

"Out of a squadron of roughly 300 cadets, on an average about one-third of these are unfortunate enough to be classed as N.C.O. pilots, not through incompetence as some may imagine in passing their examinations, but merely because

they enlisted in the Royal Air Force direct from civil life. Well I may say that a good majority of these have obtained a cadet's outfit while they were at Oxford or any other school of aviation, in many cases because they were encouraged by their C.O.s to do so, so as to look a credit to the Force, which at its best is a rag-time one. Now that we have been demobilised it is not very pleasant to have a tailor's bill hanging around one's neck. I say nothing about Service men being made Flight Cadets as it is only their due, but if the Air Ministry had issued definite orders (not known in the Air Force) to the effect that no one was to order any outfit until a certain period in his training had elapsed, nobody would grumble or say a word, but as they have not done so it is only fair that the unfortunate ones should be recompensed and not be the ones to suffer. I should be much obliged if any who see this will bring their influence to bear in this pressing matter."

It would certainly appear to be a bit rough on would-be cadets, many of whom are none too well off in these days of 8 to 15 guinea suits.

From France to Morocco

IN connection with the proposed postal service between France and Morocco, Lieut. Lemaitre, accompanied by M. Letecoere, has made a successful flight from Toulouse to Casablanca. He left Toulouse at mid-day on March 8, and reached his destination at 5 o'clock on the following afternoon, his flying time for the 1,900 kilometres being 11 hours, and the route being *via* Pervignan, Barcelona, Tarragona, Carthagena, Malaga, Gibraltar and Tangiers. The dispatch bag carried contained correspondence between Gen. Lyautey,

Military Governor of Morocco, and the Ministry of Foreign Affairs.

A Tour de France by Aerobus

In *L'Avenir*, M. Frantz-Reichel announces that a Tour de France is being organised to take place in June and July next. It is proposed that the competition shall be limited to large touring machines, and prizes amounting to £4,000 will be awarded. The start and finish are to be in the neighbourhood of Paris.



"The Bat," designed by Mr. Frederick Koolhoven, and tested by Mr. Peter Legh, climbing 20,000 ft. in 21 mins. When aerial police get going, the "Bat" will, no doubt, be a scout which aerial law-breakers will have to reckon with.

COMMERCIAL AIR SERVICE AND NORTHERN EUROPE

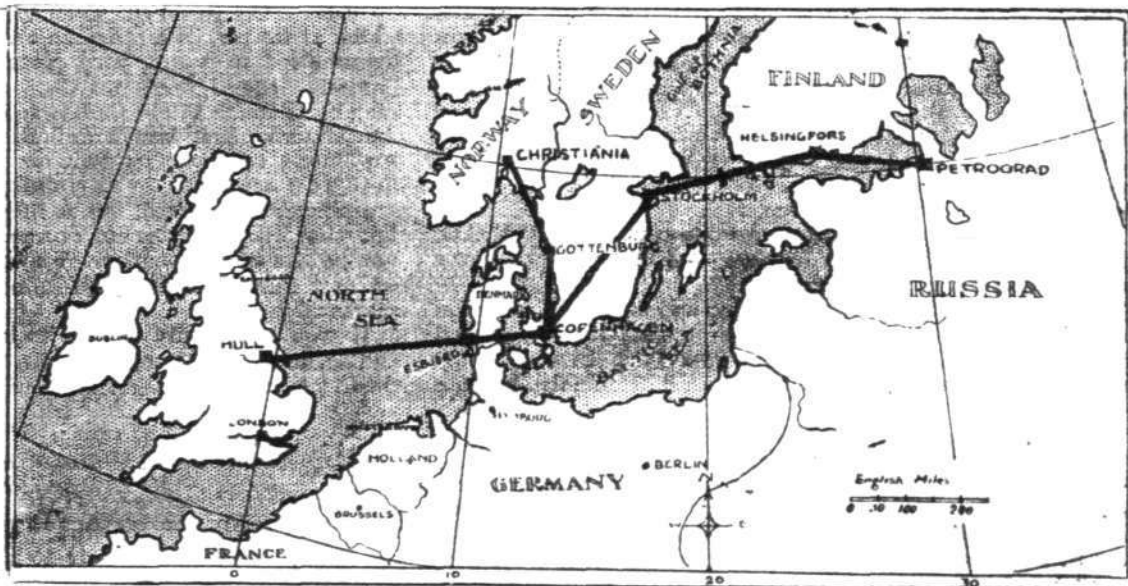
A VERY enlightening address upon our future commercial air service was given recently by Mr Stuart A. Hirst, Chairman of the Blackburn Aeroplane Co., before the Hull Chamber of Commerce and Shipping, mainly with a view to pointing the way in which our great sea transport concerns must protect their future. Mr. Hirst was naturally concerned in his views chiefly from the outlook from Hull and the East Coast, although a great deal of his paper might well be taken to heart by all who are interesting themselves in the future of commercial aviation. Facts and figures were a feature of the address in support of the general arguments of Mr. Hirst, these not being confined to aeroplanes, but embracing airship data also. When Mr. Hirst got down to details of the North Sea air service, his audience were keen listeners to the promise of success which was outlined, and we do not think Mr. Hirst in any way overdraw the possibilities which may eventuate to Hull and the north-easterly jumping-off points in his very interesting and informative address, which the accompanying sketch map helps to visualise. In this connection Mr. Hirst said:—

"International air services will undoubtedly be commenced directly the International Laws that are to regulate International flights have been settled at the Peace Conference, where this is one of the most important subjects due for discussion. We can see before us a definite prospect of a commercial aerial transport. This problem has a particular interest to Hull, because, as Hull has made itself a thriving seaport, it can be made into our most important

has been crossed on a regular daily patrol during the War and nothing thought of the performance. The North Sea is just a handy pond which is easily navigable even by our older types of flying-boats. My company are very interested in the design and construction of these vessels, and we believe that in a boat of 100,000 lbs. weight which we at present have under consideration and propose to build, and which will afford accommodation for anything up to eight tons of merchandise, we have a sound business proposition. The largest flying-boat at present used by the Royal Air Force has a disposable lift of nearly four tons, and can carry about 20 passengers. We shall be able to easily carry at least 30 passengers. What a boon it will be to certain commercial men when they can attend to their business at their desks in Hull in a morning, get over to Bremen, Copenhagen, or even Amsterdam, transact in an hour business that before would have taken a week to put through, and be back safely in their homes in Hull the same day! This is no idle dream, but an indication of what will, to my mind, undoubtedly come about before long.

"At the same time, I want to utter a word of caution. We have got so used to reading of flights from London to Cairo, and from Cairo to Delhi, and we have heard so much about encircling the globe with aeroplanes, that I want to say right here that the greatest harm will be done to flying, notwithstanding its marvellous progress, if we let the public expect too much. We must frankly recognise that many things are still impossible in actual flying. Aerial

Sketch map of the proposed Initial Air Routes of the Blackburn Co. between Hull and the Northern Continent



International air port. For the manufacturing centres of England Hull is our best outlet to the Continent. The fine, wide, sheltered estuary of the Humber affords almost unlimited anchorage for the great commercial flying-boat that will be used almost exclusively over the North Sea for the future. I have always taken the view that the War in relation to aviation has merely been an incident or a propelling force in the development of aviation to a commercially practical point, and the company with which I am connected have formulated their whole policy with the idea of being in the front rank in regard to post-War schemes.

"The future North Sea air service will be greatly assisted by the important works which we have already established at Brough, and I look forward to the day when little Brough will be helping Hull to keep abreast of the times by becoming the landing and departing station for the great air traffic that will ply between here and the Continent. The distance between Hull and the principal Scandinavian and Dutch ports is roughly 400 miles. It must undoubtedly be a great commercial advantage to reduce the time occupied in transport between Hull and these places from 40 hours to four. It will be an incalculable advantage to the manufacturer, as well as an opportunity for a profitable parcels and passenger service. I look upon the North Sea air service as a thing which we are within a very short distance of seeing accomplished. I think that the Atlantic, owing to its great expanse, presents many problems for an aerial transport company. The projected Atlantic flight is simply a demonstration, and there is no early prospect of inaugurating a commercial service. At the moment the Atlantic has not actually been crossed by air even once, while the North Sea

navigation is not yet an exact science, and meteorology also calls for deeper study by pilots. It is foolish, for example, to expect immediately the announcement of a service leaving Hull sharply at 10 o'clock in the morning and expect this service to run at once with the reliability and regularity of a railway express train.

"An unscheduled air service over the North Sea can be initiated right away with the assistance of some of the smaller Naval airships, the S.S. type measuring 145 ft. in length, rendered redundant by the cessation of hostilities. The S.S. airships stand in original cost at only £8,000 apiece, and could doubtless be turned over to a private commercial concern at a very low price if the details of the transport scheme were submitted to the Air Ministry and approved. One of the latest little S.S. airships only requires a crew of two, and could carry 700 lb. of mail each trip. They are at present fitted with five seats, so there would be room for three passengers each time if you wished to go over to Scandinavia and see your customer personally. The cost would be small, and the service could be made to pay if the letters were franked at 4d. per oz. There is an enormous amount of correspondence, as well as a heavy dispatch of parcels, between Hull and the Scandinavian countries. The present average time of three days for the delivery of mails across the North Sea would, by the new form of transit, be reduced to within 24 hours. That is to say, by airship or aeroplane, mail posted here would be assured delivery the same day in Esbjerg, Copenhagen, Gottenburg, or even to Christiania or Stockholm.

"Upon these modest beginnings I am convinced that aerial routes across the North Sea will be founded, and

these routes, with their many ramifications, employing both airships and aeroplanes, will acquire immense importance from the standpoint of their earning capacity to the enterprising carriers, and from the standpoint of the boon they will confer on the commercial communities of Hull, and even of the West Riding and Lancashire. Schedule flying will come, and come quickly—of that I am perfectly convinced—but before we have our air service time tables, we will have to go in for a great deal of unscheduled flying.

"When our pilots have studied the peculiarities of the navigation of the North Sea, and learnt to fly over fog banks, and land in safety, notwithstanding any weather conditions, and when we have ourselves compiled more definite data than we possess to-day of cost of running, then will be the time to build up from our unscheduled services a proper time-table, and, with a proper reserve of machines, keep our faith with the public by demonstrating to them the safety and utility of our North Sea air service and its reliability as to time of departure and arrival. Reliability and confidence are the first requisites in trade—whether it is a barrel of fresh fish you are dealing in or a scheduled air service.

"How near we are to a realisation of this scheme of North Sea air service can be shown by the records that are not yet published of our pilots, who, even with the earlier flying-boats, have gone out from a certain port not far from here, and have remained in the air, taken observation of the enemy's movements in the North Sea for six to nine hours at a time. This is double to three times the time required for an ordinary straight North Sea journey. It would be a

perfectly easy matter for one of our flying-boats to leave Hull, pay a visit to Bremen, and come back to Hull without any intervening landing. You will see that I am looking at the matter from a cold commercial standpoint. I believe in the service; I want it to come; but I don't want to disappoint the public by saying that this service can be started in three or six months' time as a scheduled service.

"I would certainly like to see the foundations laid for such a service at once, because it is a service that is capable of tremendous development. It is said that the Cunard Line are deeply interested in the bigger questions of aerial transport, and with their experience of Government subsidies they would naturally know the right way to set to work. Certain it is that both the Cunard firm and Harland and Wolff's of Belfast are intimately concerned with aircraft work.

"It is a natural sequence that our Hull sea-transport concerns should protect their future by taking an early interest in the obvious supplanter of sea-transport—for mails and passenger—air transport. If Hull is first in the field, I know that the natural enterprise of Hull people will take care that Hull is made—and maintained as—not our third, but our first air port.

"My belief is that the airways in the near future will be not one whit less important than our seaways and our roadways. And I prophesy that eventually air travel will be the cheapest, safest, simplest, and most convenient, and, as it has always been destined to become, one of the natural ways of transport.

THE AIR FORCE ESTIMATES

The Air Force estimates for 1919-20 show a maximum establishment at home and abroad, exclusive of those serving in India, of 150,000. This number is in process of reduction to 79,570.

Details of the strength of the force to be retained at home and abroad, exclusive of India, when the demobilisation now in progress has been completed, are as follows:—

Armies of Occupation.	Officers.	Men.	Total.
Army of the Rhine, including troops in France and Belgium	1,620	15,800	17,420
Armies of the Middle East—			
Italy	10	50	60
Egypt and Palestine	180	1,620	1,800
Mesopotamia and North Persia	160	1,160	1,320
Home and Colonial Establishments, including units in Russia and with the Grand Fleet ..	4,300	54,670	58,970
Totals	6,270	73,300	79,570

The figure of 79,570 represents the total number of officers and other ranks to be retained during the period of occupation, exclusive of formations stationed in India.

The total of 150,000 is the maximum number of personnel of the R.A.F. estimated to be serving on any day during the year covered by this estimate; but the lesser number of 79,570 should, under the present scheme of demobilisation, be reached at an early date.

Those who have passed through dispersal stations, but whose period of furlough will not have expired by March 31, 1919, have been included in the number of 70,430 shown as being in course of demobilisation.

A vote on account of £45,000,000 is asked for, representing five months' expenditure.

As regards expenditure, the total estimate in respect of the new financial year is £66,500,000. For 1918-19 the expenditure is estimated to amount to £71,000,000, but it is explained that the estimate of £66,500,000 for 1919-20 includes approximately £31,000,000 in respect of services which, in 1918-19, were borne mainly by Ministry of Munitions funds, and to some extent by Army funds.

In the House of Commons, on March 13, the Air Estimates were considered in Committee, the first motion being "That a number of Air Forces, not exceeding 150,000, all ranks, be maintained for the Service of the United Kingdom of Great Britain and Ireland at Home and Abroad, excluding His Majesty's Indian Possessions, during the year ending on the 31st day of March, 1920."

The Under-Secretary of State for Air (Maj.-Genl. Seely): In asking the Committee to accept the Air Estimates which are laid before them to-day, I cannot help recalling that it is almost five years to a day since I was privileged to submit Estimates of £1,000,000 to this House for the War part of the Air Estimates in 1914. We now submit Estimates of £66,500,000, and, as I shall presently show, had the War gone on, it would have been £200,000,000. Before we come to the financial aspect of the matter, I think it would be right, and I am sure the Committee would think it right, that we should pay some tribute to those who have been concerned in raising our air power to such a pitch of intensity as it had reached when the armistice was signed. I do that more freely because I had no share in it myself, as I was away during the whole of this period. Of course so great an expansion of any war effort has never been seen. We started then with six squadrons. We finished with about two hundred. We were spending then £1,000,000. At the date of the armistice we were spending £2,000,000. At the earlier date we could build comparatively few aeroplanes and very few engines. When the armistice was signed we were building 4,000 aeroplanes a month, or nearly 50,000 aeroplanes a year. I suppose that credit must be given to those who directed affairs and to successive Ministers of Munitions, and those who worked with them for this marvellous expansion. The greatest credit of all is due to the personnel, the pilots and observers, who raised this country's air power to a point which I think we can say without fear of contradiction was not attained either by our Allies or our enemies, and at which we were indeed the masters of the air. That was due, in the first degree, to the astonishing valour of our airmen. It so happened that I witnessed in France the first air combat—it is referred to in Sir John French's

first dispatch—when one German aeroplane was shot down. I remember Sir David Henderson saying to me on the same day:—

"This is the beginning of a fight which will ultimately end in great battles in the air in which hundreds, and possibly thousands, of men may be engaged at heights varying from 10,000 to 20,000 ft."

I said to him:—
"Is it possible that human endurance and human courage will be equal to that stupendous task?"

He thought so, and he was right. I hope I shall shortly publish to the House a record of the War effort of the Air Force. It will be, I am sure, a revelation even to this House—which is specially well informed on air matters, as it has so many members who have served in the Air Force—of the wonderful things we have done in all the theatres of war. To take only one figure, from that one air combat which I remember witnessing in September, 1914, air combats grew until we have this astonishing figure: During the War just under 8,000 enemy machines were shot down by our pilots in all theatres of war; 2,800 of ours were missing and most of them similarly shot down. When we think of what that figure means—probably 40,000 or 50,000 desperate battles in the air, sometimes far away into enemy territory, occasionally right across wide stretches of sea where an engine failure at any moment might prove fatal, we can only bow our heads in respectful admiration of the incomparable valour of our airmen. Of course, the great reduction which we must now make in numbers will cause considerable hardship to the manufacturers of aeroplanes and to their employees and it will cause great dislocation, but I think the people to whom our sympathies must first be due are the brave young pilots to whom I have referred who will have to return to civil life. It is extraordinarily difficult to demobilise an Army, as my right hon. friend the Secretary for War and Air knows, and it is difficult to demobilise the Navy; but it is particularly difficult to demobilise an air force, because the training given to a pilot—although he gets a certain amount of engineering knowledge, and although the other knowledge which he obtains is of supreme value to the State in time of war, requiring as it does a standard of skill and courage almost greater than that required in any other walk of life—does not particularly fit a man for civilian employment. Therefore our pilots will find particular difficulty, as compared with the corresponding officers of the Army and Navy, in fitting in the ordinary work of the world, and if I might I would respectfully appeal to all concerned to help in that matter.

On that point may I say that we have come to a certain decision with regard to cadets. There were about 30,000 officers and 25,000 cadets under training when the armistice was signed. Of course these 25,000 cadets will be required in comparatively small numbers for any purpose of the air, including civilian aviation. So vast a force cannot be required for many a long day now that peace is in sight. The hardest case is that of the Colonials from South Africa, from Australia, and from New Zealand, and some from Newfoundland, and others from other Colonies. We have decided that all Colonial cadets shall receive temporary commissions to be granted as from February 12, 1919. They will receive gratuities on the men's scale and uniform allowance on the full officer's scale of £50 will be granted. They will have first-class passages for the voyage home to the Dominions and on arrival there the temporary commission lapses and they will receive an honorary commission of the rank which they held. The cadets, other than Colonial cadets, whose training was discontinued on account of unfitness, will be demobilised and will receive honorary commissions on demobilisation unless they express a wish to the contrary. If they graduated B before December 31—and Graduation B means the completion of the first half of the course—they will receive full outfit allowance of £50. If graduated B after that date and not before demobilisation they will receive a refund of the actual expenditure, including issues in kind, up to the maximum of £35.

I hope the House will forgive me for having gone into detail on this matter, because the case of the cadets is the hardest one with which we have to deal in reducing our forces to the comparatively small limits which are now found on the Votes which I have read to the House. The total we ask for in money as a Vote on Account is £45,000,000, and that is out of a total estimated—and I dwell on the word "estimated"—of £66,500,000. It is quite impossible, until peace is signed, for us to commit ourselves to a precise sum as a total. We are pretty sure that this is an outside figure; we hope it may be less, but that is our estimate of the outside figure which will be required, and I think the House will see that in the case of the air it is peculiarly difficult to estimate in advance until peace is signed, for the value of Air Forces, especially in outlying parts of the world, such as the Near and Middle East,

is so incalculable, as I shall have occasion to show in a few moments, that it might be necessary to reinforce squadrons in disturbed areas even though we were pretty certain it will not be required now. It might, conversely, be quite easy to withdraw squadrons if peace is made on terms more favourable than we think. We ask for £45,000,000 on account, and £66,500,000 is the Estimate which we have arrived at as the outside cost required for the coming financial year up to March 31 of next year. There is a note here comparing the £66,500,000 with £71,000,000 of last year. That is not an accurate comparison at all. The House might well say "this is a ridiculously small reduction of only £5,000,000 as compared with last year," but in last year's account of £71,000,000 there was only the Air Force Account not paid by the Ministry of Munitions and the War Office. The Ministry of Munitions added to that sum for purely Air Forces £113,000,000, the War Office £4,000,000. So that if we compare like with like we compare £66,500,000 with the total of £188,500,000. We have, in fact, reduced our Estimates almost exactly by two-thirds as a consequence of the armistice. How difficult it was to make a reduction—and here again I say there are peculiar difficulties for the Air Force—will be seen by these figures. At the day when the armistice was signed we had outstanding liabilities of £150,000,000 sterling for equipment for the Air Force, the greater portion of it being aeroplanes. We had facilities for making, and were, in fact, making aeroplanes at the rate of 4,000 a month, or nearly 50,000 a year. It is not a matter for which the Air Force can take credit, or discredit—but I think credit—because the Ministry of Munitions had to deal with this question of the cancellation of contracts. We did not, of course, require anything like the material represented by £154,000,000. The Ministry of Munitions have been able to reduce that sum by just over £89,000,000, leaving a total war liability to be liquidated, some of which was required, but, of course, by no means all, of £66,500,000. Of that sum £39,000,000 will be expended this year and £26,500,000 falls in the next financial year. This is out of the £66,500,000 which we are asking for. One big item, the biggest item, is the £26,500,000 of war contracts, which represents the surviving liabilities which have been retained after the Ministry of Munitions have cancelled the other contracts.

Mr. Joynson-Hicks: This will be wiped off in the current year?

Maj.-Genl. Seely: Up to March 31 this year we shall pay £39,000,000; during the next year, from March 31—this month—up to March 31 next year, we shall absorb the £26,000,000.

An hon. member: Might we know approximately how much goes in compensation and how much for goods delivered?

Maj.-Genl. Seely: I have some information on the subject, but I think I had better not give it. It is rather long and complicated, and really a matter for the Ministry of Munitions. When the Vote comes up the Ministry of Munitions will be able to explain fully how he has liquidated this and other contracts, if the hon. member will put a question.

It may be convenient to attempt to divide this sum of £66,500,000 into non-recurring and recurring expenditure. Of non-recurring expenditure we put first this £26,500,000, but, of course, although it is non-recurring expenditure in the sense that it is a liquidation of war contracts, it would not be fair to tell the House that it could be all regarded as non-recurring; because whatever number of squadrons we maintain will require fresh equipment, not up to anything like a sum of £26,500,000, but still a very considerable sum year by year; so that, although we say that for the purposes of strict accounting, £26,500,000 is non-recurring expenditure, it must be borne in mind that there is other expenditure of a similar nature that has to be met in succeeding years.

Now we come to expenditure which is really, as well as theoretically, non-recurring. The first big item is personnel, which is £6,000,000. That applies to all the personnel that is disappearing on the reduction of the Force, both officers and men. The next big item is lands and buildings. This represents part of the vast sums we were spending on aerodromes, hangars, meteorological stations, and all that portion which we cannot require, even when in times of peace we require a considerable expenditure in connection with military and civil aviation for the same purposes of aerodromes and hangars. The next big item is Canada—nearly £1,000,000. This represents repayments to Canada for her contribution to our Air Forces in men, for pay, allowances, and clothing. And here one may be permitted to say that, although this House and the country owes to all the Dominions a debt it can never repay for their help in securing the aerial supremacy of this country, the largest debt in volume is due to the Dominion of Canada. Of course, she had the largest population, and one would not make invidious comparisons as to the services rendered by the various parts of the different Dominions. Canada, it so happens, gave the largest contribution in numbers, and of her services those who know what Canadian airmen did will not require to be reminded. They were second to none.

I commanded Canadian troops nearly all through the War, and I sent more than 100 of my own men to the Royal Air Force. Of course, they corresponded with me, and I kept a friendly eye on their achievements, and naturally, therefore, it happened that I know perhaps better than most of the great services that Canada rendered to us during the War in the air as well as on land and sea. That brings up our total, if we add the miscellaneous charges of £1,000,000 for petrol, oil, and other miscellaneous charges, which are non-recurring, to the non-recurring portion, to £39,000,000. There remain the recurring charges, which comes to about £27,000,000. These recurring charges are, personnel £18,000,000. Then we have for equipment £2,000,000. This does not represent any large number of new aeroplanes outside those included in the £26,000,000. I fear this will be bad news for our great aviation companies, because it means that after the existing orders have been completed there will be but few fresh orders for several months to come. I hope at the earliest possible moment to be able to give an intimation to all concerned of the probable number of aeroplanes, within very wide limits, which will be required in future years. It will be difficult to arrive at the exact figure we require, so that they may know what there is in store. But for the moment it is not possible to give even that estimate, because we cannot tell what is the size of the force which it will be necessary for us to maintain until we know what kind of peace we are going to make.

In addition to £2,000,000 for equipment—and these, of course, are all proportionate to the £66,500,000; in the event of our asking for a decreased amount it will be correspondingly decreased, and in the improbable event of our asking for an increase it will be correspondingly increased—there is a further sum of £2,000,000 for land and buildings. I have dealt so far with personnel and the technical equipment. This is in addition to the very large sum of £5,000,000 which I referred to previously for lands and buildings. This represents the minimum sum which will be required to complete the aerodromes, hangars, and other equipment which we shall require for the Air Force of the future, and for the needs of civil aviation. A good deal of it is really very necessary, and I hope the House will sanction it in order to increase the comfort of officers and men of the Royal Air Force in all parts of the world, and especially in the remoter aerodromes in this country. Any hon. member who has been to some of the aerodromes in this country which were necessarily put up in a great hurry during the War, will know how far more uncomfortable both officers and men are than any men in the Army or Navy, except in the actual theatres of war. I think it was unavoidable when you were expanding the force from 1,000,000 to a 2,000,000 basis. But now that peace is in sight, and hostilities have ceased, we cannot ask officers and men any longer to remain under these conditions. Orders have been given at once, in anticipation of the sanction by the House of these Estimates, or this portion of them, that all men are to have beds to sleep in in this country,

and wherever hostilities are not prevailing, and that reasonable furniture for both officers and men shall be provided to give them some kind of modest but reasonable comfort such as is enjoyed by soldiers and sailors in all parts of the world. There is a large item of £2,500,000 for miscellaneous charges. This includes petrol, oil, lubricants, all kinds of miscellaneous services which, so far as I have been able to examine it, cannot be sensibly reduced. It allows, of course, for far less flying than was done in time of war, but I think the sum, large as it is, cannot be reduced. These two items recurring and non-recurring together, come to a total of £63,000,000. There remains a sum of £3,000,000 which we have specially set aside for experimental research and civil aviation. I do not think the House will grudge this item when I explain the reason for which it is asked.

The Committee will want to know why we want this large sum. It is a reduction by more than two-thirds of what it would have been had the War continued, and by nearly two-thirds of last year's expenditure. I think the Committee will say that is a considerable reduction. I believe the balance has been just in endeavouring to save the taxpayers' money and at the same time in ensuring that there is no undue hardship in the cancellation of contracts on the one hand and no risk to the safety of the State on the other. We provide for the number of men I have stated in the Vote. We estimate a larger figure up to July 31, thereafter sinking to what we estimate will be our peace figures, approximately 5,300 officers and 54,000 men. We have fixed provisionally the number of squadrons we require at 102. Of these we require a certain number at home. There is not much risk of this country being attacked at present from the air. However disturbed we may regard the state of Europe as being, especially in the Near East and on the borders of Russia and Prussia, we still can say for the moment that the risk of aerial attack is very small. But he would be a rash man who said there was no risk of this country being attacked in the future, and I am sure all hon. members who consider the subject will see that the power of aerial attack is so great and so swift and that the preparations for it can be made so secretly that we should be gravely to blame, anxiously as we look forward to a more peaceful world, certain as we are that we shall secure a just and a lasting peace, if we neglected the defence of what I may call our air as we protect our surrounding seas. We therefore retain the nucleus and the organisation of our Home Defence force, and, although we do not want a great many squadrons for the moment, we must have them available for Home Defence in the same way as we maintain our Navy and that portion of our Army which is required for a similar purpose. But of course in defending our islands, and by so doing defending the integrity of our Empire, against hostile attack if it should ever come from the air, we do not rely so much on great numbers as on remaining in the forefront of aerial development, on aerial research, on being able always to have the best aeroplanes of the newest type. It is on being first in the art of flying that we must rely for our aerial supremacy.

In addition to Home Defence there is, of course, the large commitment of the proportion of the force for the Army of the Rhine and for the other Armies of Occupation of the countries with which we have recently been at war. The Secretary of State for War has considered very carefully, in consultation with the Chiefs of the Staff both of the Air Ministry and the War Office and the corresponding officers at the Admiralty, and with myself and General Sykes, as to what shall be the proportion of the Air Force to be maintained with the Armies of Occupation and with the Fleet, and we have arrived at what I think is a just figure. Speaking for myself, I believe the proportion of air force to land and sea forces will be an ever growing proportion. I am not at all sure that within a few years air power may not make fleets and armies as we see them obsolete. Certainly that would be so if the progress in the air were anything like as rapid in the next ten years as it has been in the last ten. But we are dealing with the present, and we have fixed upon a certain ratio, and as I think a comparatively modest ratio, of power to land and sea power, and on that is based the approximate figure of 102 squadrons which my right hon. friend has fixed. Of course, in addition to the Rhine forces there are the forces required in Egypt, in Mesopotamia, a few in Archangel and elsewhere, but the greater proportion in Egypt, Mesopotamia and the Near East, and it is there where air power is at its greatest demand. It is there where air development will very likely have its greatest future as it has its greatest present.

The Committee, I know, likes a definite fact. Here is a definite fact. Our political officer at Bagdad not only can but does do the same inspections, where necessary, in order to secure continuous friendly relations between the inhabitants of those regions and ourselves, as it is desirable to maintain, in two days as he could do before in two months. I think that one fact is an astonishing justification for this claim that especially in those regions where there are wide spaces with a perfect climate and an almost complete absence of the airman's real enemy, mist and fog—not wind—and where communications of other kinds are so faulty, you can do things by air which you could not possibly do in any other way. It is there where air travelling might even at once be profitable for all kinds of mails and samples and goods of a like nature. But I am not dealing now with the civil side. On the military side the fact that our political officer at Bagdad can do in two days what he could do in two months is only a symptom of the immense power that is exercised by a squadron or a flight of aeroplanes in these regions. Genl. Salmon himself flew from Cairo to Karachi and on to Calcutta, and another aeroplane did the same trip. Genl. Salmon told me that flying over these regions, which are hardly ever visited by white men and the natives of which had never seen an aeroplane before, as he saw the houses in the distance, they would be crowded with people looking up to this strange new portent, the aeroplane in the sky, but that as the aeroplane approached in every case they disappeared and not one man over all these hundreds of miles of country ever dared to come out and look the aeroplane straight in the face. As time goes on, no doubt, the natives of these countries will cease to be so much afraid of our aeroplanes, and their value in securing quick communication and in preventing, perhaps, misunderstanding which would result in a war by the immediate presence of the officer concerned, cannot be exaggerated. I hope, therefore, that the Committee, in sanctioning these Estimates, will bear in mind the great advantage they will be to us in the Near and Middle East.

It may be convenient here, if I say in a phrase, it must be only a phrase, that the possibilities of carrying the mails from Cairo to India are extremely favourable. How best to do it, whether by carrying them by members of the Royal Air Force or by putting it up to public tender, or by means of a chartered company, something on the lines of the original East India Co., is a matter for future consideration, though not for long delay. What I would like to tell the Committee is that we have the aeroplanes there now which could, in fact, carry the mails. A careful estimate has been made by a responsible officer who has been there, which shows that in his judgment it would be profitable to carry the mails, and the Postmaster-General himself, having gone into the matter, is enthusiastic in support of it, and will co-operate in every possible way as soon as that service can be started. My right hon. friend the Secretary of State has always said that he believes that this is the first service that could be wisely and profitably undertaken by the air, and he proposes to concentrate the efforts of the Air Ministry on this first. There are, of course, other routes which I will refer to, but this one, having a peculiar strategical value, is the one where we can well make our first start.

We have got a force which we are reducing by three-quarters, the cost of which we are reducing by two-thirds. The Estimate may seem to the Com-

mittee a large sum for military aviation, but I do not know that it is so very large when you consider how great a reduction has been made. But I would add this in turning, as I now do, to civil aviation, that you cannot measure in terms of money how much of this will be for the advantage of civil aviation and how much for military aviation. We specifically say £3,000,000 for civil aviation, experiments and research, but far more than that is of advantage to civil aviation which comes out of the military £63,000,000. First of all there are all the military machines which we are building. No doubt there will be constantly increasing divergence of type between the military and the civil type of machines, nevertheless the building of the military machines is a means of keeping the aircraft industry going. Then there is research for military purposes which is of value for civil purposes also. The great expenditure on meteorology is, of course, of equal value to both. In the case of aerodromes we must obtain and maintain a considerable number all over the world, and nearly all of these will be available for civil aviation, and even those few that are retained, that are retained exclusively—and they are very few in number—for military and naval purposes will, of course, be available on emergency for emergency landings. Therefore we cannot measure in terms of money how much of our military expenditure is of value to civil aviation; but we can and do say that the whole resources of the Royal Air Force, as far as is consistent with the purpose of their military duties, are and will remain at the service of civil aviation. On the side of civil aviation, pure and simple, I might say that we take of this sum of £3,000,000, specifically, £2,000,000 for research and experiment, £500,000 for special new types of machines, £500,000 which has been asked for by Genl. Sykes, Chief of Civil Aviation, for the special purposes of his Department, in addition to the other large sums which are available for civil aviation, as I have described them. I cannot say that that £500,000 is a final figure. Genl. Sykes himself said to me, "The worst thing to do is to definitely lock up money which you do not want at once to use." Therefore, it is much wiser to take a modest figure to start in order to see how far it will go for the necessary purposes which I hope now to describe to the Committee.

What is to be the duty of the Controller-General of Civil Aviation, who has charge of the civil side of the Air Ministry? His first duty will be to complete the international agreement in Paris in regard to the future of flying. Flying is and must remain in many respects an international business. There are no natural boundaries in the air, and you cannot have successful civil aviation unless you come to an agreement first with the Allies, and then with the rest of the world, as to the way in which flying is to be conducted. We have done much already, and Genl. Sykes was our representative in Paris all through the earlier stages of the negotiations. We are far more advanced than any other country in the preparations made for civil flying. I am very glad of criticism, and the more we are criticised the better it will be for us. If the suggestion is that we have not done enough—well, I quite agree, we can never do enough—but if the suggestion is that we have done less than other countries I would say that that is erroneous so far as our information goes. We are far further advanced than any other nation. We are the first nation to have legislation such as we passed the other day. We are the first nation to have regulations for our own civil flying agreed to by all concerned. We are the first nation who have drawn up a draft of an International or Inter-Allied Convention. The draft of this Inter-Allied Convention has been agreed to, I am glad to say, by the Dominions and India. We have shown it to the other Allies, and I hope and believe that in great degree they will accept the principles contained in our draft. There has already been the first meeting of the air side of the Peace Conference, and the next meeting as at present arranged is on Monday, when my right hon. friend has directed that Genl. Sykes and myself, with technical officers, shall represent this country in Paris. I hope I shall be able to report to the Committee before very long that the principles of the draft aerial convention we have drawn up have been generally assented to by our Allies, and if they are, I have little doubt that the other nations of the world will shortly join.

The next duty on the civil side will be to plan air routes at home and abroad, and not only to plan them but to get them ready. The Controller-General has already drawn up a list of the aerodromes that will be required in this country for civil aviation, as well as those required for military purposes. As soon as we have settled, as we practically have done now, on the required aerodromes, we shall set to work to equip them properly with meteorological stations, if not all, a great number with sound and light signal stations, with beacon stations, with aerial buoys; in fact, balloons with special marks, with telephone and telegraph stations, with directional wireless as well as ordinary wireless, enabling you to direct your aeroplane from the ground by information you send by wireless, and, I am glad to say, with wireless telephony, in which during the last few days we have achieved a result which the right hon. member for Blackburn (Sir H. Norman) knows we have been trying to achieve for many years. We have got a wireless telephone with which on the same machine you can both send and receive from the same operator. Until a few days ago it was possible for one aeroplane to communicate to another, but it was not possible for the same aeroplane to receive an answer. Now the difficulties are overcome, and we have got a satisfactory instrument which does this remarkable thing, which will be of immense value to military flying. Therefore the second duty is that we have to complete the aerial routes at home and abroad.

Mr. Joynton-Hicks: Can the right hon. gentleman say whether the completion of these routes and the fitting up of aerodromes is to come out of the £3,000,000 for civil aviation?

Maj.-Genl. Seely: For this year we estimate that is all we shall be able to spend. A good deal of what I have described is already in existence at the stations. Some new things will have to be put in. We have taken this money, and in this case I am glad to say we have not been hampered in any way by the Treasury. We have got what we asked. I think we have. At any rate, I am sure that if the Committee approves, the Treasury will raise no formal difficulty to a sum which they have already provisionally approved. Abroad much has already been done which is not known in the making of aerial routes. We have surveyed the whole aerial route from Africa to India—that is, from Cairo to Karachi—and aeroplanes have actually flown from Calcutta. We have surveyed the route from Cape to Cairo. There are surveying parties out there at this moment. There are three parties in Africa between Cairo and the Cape who are choosing aerodromes and making plans for the great air route to be opened. I say nothing about the Atlantic route, because that is a difficult matter, and the less said about it the better until we are sure we can do something at it. It is no good boasting that you can do this, that, and the other until you have seen your way clear.

The next duty in the Civil Aviation Branch, under Genl. Sykes, will be to examine and advise on all schemes of aerial transport and to assist them in any way in which the Air Ministry can do so. And the Air Ministry can assist a great deal, because, owing to the fact that the whole of this great system has grown up during the War, nearly all the pilots and, in fact, all the best brains are either in the Royal Air Force or the Air Ministry or are found among the different firms and inventors who worked for us during the War—because everybody who had a plan, an idea, or a factory ungrudgingly threw it into the common stock during the War. As we have so great a proportion of the pilots and the brains, we can help very greatly in all aerial plans. Fourthly, there will be the registration and licence of pilots and aircraft for all civil purposes. We are bound to perform functions such as fall upon corresponding Government Departments with reference to vessels at sea. But as much is taken from the shoulders of the Government in the

case of ships by the co-operation of Lloyd's and "Lloyd's Register" we hope that those two great bodies will assist particularly in the matter of inspection. I had the privilege of meeting members of both bodies within the last few days, and I think that they will co-operate with us. Certainly we will be very grateful to them if they will. And a scheme of insurance such as they have adumbrated will be of great value in setting the industry on a sure foundation, the Government meantime maintaining, as in the case of the sea, its special responsibility for the safety of the public.

I would like to pay a special tribute to various men of science who have been good enough to advise and help me in considering the various subjects on which I have touched to-day, notably Lord Rayleigh, Sir Richard Glazebrook and members of his committee, and Sir Charles Parsons and many others have been good enough to write me fully their views as to the possibility of future aerial travel and transport, because, after all, this is a scientific question first and foremost, and it is men of that type, and the younger men of science, who can alone lead us along the right path and help us to secure good results in peace time after the tremendous advance which has been made in air travel during the time of the war. Everyone of these men dwells upon the enormous advantages of continuous research, the vital importance of providing money for it, the essential need of the experiments which must be carried out on methods of propulsion, on the structure of wings, on stability, and on retarding machines on landing. All these and kindred subjects are of vital importance, and on them depends really the future of civil aviation.

It is not a dream to think that we may make great advances. We have made many remarkable discoveries during the War. I have referred to one—wireless telephony—which we have at last perfected. There are many others. I have here a long list of the things that have been done. I will only mention one or two. There is one which will interest this House because a member of this House, the member for Chatham (Col. Moore-Brabazon), had a very large share in inventing a most useful apparatus—the air camera—by means of which we can take a series of photographs from the air and from great heights which will give you a more accurate survey of the land over which you pass than you could obtain by weeks or months of surveying in the ordinary way. That has been of incalculable value during the War. This only requires to be stated to show what its value will be in time of peace. Another remarkable invention, if you can call it an invention, because it is an adaptation of what was known before, is directional wireless. The Germans were the first, I am advised, to use directional wireless with effect, but fortunately for us we could always intercept them, and as we had got their code the directional wireless which enabled them to fly enabled us to know exactly where to attack them. But we had a system of directional wireless which had most of the advantages but none of the drawbacks of theirs. Now that peace is come there is no need to further conceal the fact that we have been able to direct machines from the ground with complete success, and, in the view of the experts who have charge of this particular arrangement, is in its infancy. One of the greatest problems of the air—to know where you are after a long flight in misty weather, through a medium not travelling a few miles an hour as on the sea, but 50 or 60 or 70 miles—may by this means be overcome.

In the way of actual experiment it will interest the House to know that before the War ended we were experimenting not in the way of laboratory experiments, but in actual design, with various types of a novel kind. There is one machine now being built, a seaplane of a very novel type of a very great size. This one has advanced so far that it has actually been flown. It has five Rolls-Royce engines, and carries 13,000 lbs. at the rate of 100 miles an hour, which is a very large weight to carry at that speed. Another experimental aeroplane is being built which is even larger. It was not intended for peaceful purposes, but we hope that it will be of use now that peace has come. It has a span of 141 ft., it is 85 ft. long, and will carry a useful load of just under 20,000 lbs. This is not completed, but if we can take a line from the performance of the seaplane it should probably be a success. Moreover, we have another aeroplane of which the plans are completed, far larger than either of those with eight engines, developing possibly a very considerable speed, and taking a much larger load than either of those two to which I have referred. Then we have under construction an entirely novel type of aircraft, which I will not particularise, but of which one can say, although it is quite possible that it may not succeed, that the mathematicians say that it should attain a speed hitherto quite undreamt of, and, of course, having qualities of a kind quite different from anything which we have seen. I hope later on in the year that I may be able to give some information about this somewhat remarkable invention. But even if it fails we shall learn useful lessons from it.

Sir Charles Parsons tells me one thing which I think will be new to most members of the House. It certainly was to me. It is as to the properties of airships which, in his judgment, contain immense possibilities in the future. The tractor power required to pull a given load, given the same speed, varies almost exactly inversely with the size of the vessel. Suppose you take an airship 750 ft. long and assume it to have a speed of 60 miles an hour and a displacement of 64 tons, the estimate is that you will require 5 per cent. of that 64 tons in order to pull your vessel at 60 miles an hour. But if you increase the length to 1,500 ft. and get, as you would do with the same form, not 48 but 164 tons, you would require not 5 per cent. but 2½ per cent. in order to give that the same speed—that is, by doubling the size of your vessel, you require only half the horse-power to do the same work. Sir Charles Parsons pointed out to me further that although this does not apply in the same degree to sea vessels, it is to a certain extent true with regard to them. But here designers are limited and have throughout been limited by the fact that harbours do not accommodate vessels of more than a certain size without the expenditure of dredging which would, of course, run into tens of thousands and millions if you once got vessels eight or ten times their present length. But in the air there is no such limitation. The atmosphere reaches up to 50 miles and the depth of harbours is limited as a rule to 40 ft. So, in his judgment, there is an immense possibility for the airship, and I quote Sir Charles Parsons, who has been good enough to write me a memorandum on the subject, because of him you may say that he has that most valuable brain which combines great speculative power with, as everyone knows, the power of concrete application to turbines and other practical things in the highest possible degree.

There are other things of great possibility. There are flying boats which may do wonderful things, especially on the great navigable rivers of the world. From the sea to the source of the Nile is, I think, between 4,000 and 5,000 miles. My right hon. friend (Mr. Churchill) travelled it the whole way and he ought to know. There you have a perfect landing ground the whole way for a flying boat. The sea is not a perfect landing ground because the waves are rough, but a thing like a river does, so those who fly seaplanes inform me, provide a perfect landing ground. When one looks at a map of the world and sees the navigable rivers, up which ships can only slowly toil at an average of six or seven miles, and are then constantly stopped by rocks and other obstacles, all of which are nothing to a seaplane, one sees the immense possibilities of seaplane travelling in the future. In commending those Estimates to the Committee I must apologise for having spoken at greater length than I had intended, but the subject is of such absorbing interest and of such vital importance that I trust I may be forgiven. Nobody can ever be certain he is right in this matter. It is so speculative, the whole business is so new, that everyone must be prepared to make a fair number of mistakes. But that is no reason why we should not try, and try our hardest, and why we should not enlist the best brains in our support as we

have had during the War, and I am quite sure that if we do that we shall be able to retain that which we now most certainly have, the first place in the world in air development.

Capt. Wedgwood Benn: I am in a rather peculiar position in this matter, because, taking the figures for war services generally, it seems to me an extraordinary thing that we should, after winning the War, spend six times as much on armed services as we did before we started the War. But if you are going to spend six times as much, I do not consider that the right hon. gentleman has taken an excessive if he has even taken an adequate proportion in the figure which he has set aside for aerial purposes. The first question which I wish to ask is this: I believe that the old practice of the House was to give a general sum under Vote 1, but when Vote 1 was asked for all the details of the other Votes were given to the Committee at the same time, so that although by Treasury sanction money given to Vote 1 was actually used for the air, the Committee was in possession of all the figures at the time when they gave the money to Vote 1. We are not so to-day. We are not in possession of the figures under the various heads, and yet we are voting to-day for the Service £45,000,000, which may be sufficient to carry on the Air Office until the time when the remainder of the Votes can be taken under the guillotine, so that the right hon. gentleman will see that we are giving him the money without being apprised of the particulars, and without any guarantee that we shall be in possession of the details at all. I would, therefore, like to ask him whether he will give us another opportunity before the end of the Session of debating the Air Service in a general manner when we are in possession of the details under the various heads? I hope that in the matter of the large new designs of which he spoke, practical experiments will be made before too much money is spent, because everybody who knows these seaplane stations in the country is aware that during the War there were immense machines, absolutely new, lying in the aeroplane stations which had never flown at all, and on which very large sums had been spent, on excellent plans, but without the necessary practical tests having taken place. I do not know whether it would be possible to suggest to the right hon. gentleman that in the management of the research branch there should be associated, outside the fighting Services altogether, the services of distinguished men of science who take a general interest, but are not associated directly with the Air Service. The right hon. and gallant gentleman spoke of our foremost position in civil aviation. Of course, we want to be first; but he must remember what for months past in the United States of America they have been running mails and publishing the costs month by month showing the results achieved; and while that is so, we can hardly claim, although we may desire it, to be absolutely in the foremost position.

On the Service side, I want to ask the Air Minister one or two questions. He gave a very interesting description of the possibilities of airships. Can he tell us anything about the present relations of the Air Ministry to the Airship Department? I think the personnel is trained by the Ministry and left to the Admiralty, and I think the construction is undertaken by the Admiralty. We should be interested to hear whether any further step has been taken in the direction of associating the Airship Branch with the Air Service, because, in the matter of international routes and mail-carrying pioneer services of one kind and another, it is quite obvious that the airships must play a very important part. I would like to ask the Air Minister, also, whether he can renew the assurance he gave during the debate on the Address that nothing whatever is being done to disrupt the integrity of the Service, and that there is no danger whatever of either of the fighting Services desiring to take away from the unity of the Air Service? I should like the right hon. and gallant gentleman to explain a little in detail, if he can, what has been done in the way of taking over by the Air Service of some of the work in distant garrisons previously done by the Army, as that is one of the reasons he gave for the dual arrangement. The right hon. Gentleman's predecessor gave a definite pledge to the House that a separate medical service would be set up for the Air Service.

There is only one other point to which I would allude, and that is the position of observers in the Air Service. I speak with some feeling in this matter, but, constantly observing things from a very subordinate position in the Service, I have been struck with the mistake which is being made by not giving a sufficient status to the observer.

Mr. Joynson-Hicks: May I take up the point raised by my hon. and gallant friend who has just sat down, that of the alteration of the position of the observer. I quite agree with what he has said. It takes me rather to another point, which I proposed many years ago, and that is in regard to the position of the non-commissioned officer pilot. My right hon. friend knows that many of the German squadrons were piloted entirely by non-commissioned officers, and the observer was really in command of the particular machine, and whether that could be so in our Air Service or not I do not know, but I suggest to my right hon. and gallant friend that he should extend the position or the number of non-commissioned officer pilots. The commissioned pilot, if I may say so, is rather an expensive article to use, and I also think that as flying goes on you will find a very large number of what I may term the chaffeur type of engineers who would make excellent pilots, and do it at much less cost to the country than the officer pilot.

I am not complaining of that, but I am going to ask my right hon. friend to realise that on the next occasion he presents Estimates we shall ask him to present the ordinary detailed Estimates. Then we shall know—and I speak as one who demanded higher Estimates in the past—whether the country will be able to afford £45,000,000 per annum for the Air Force in the future.

Maj.-Genl. Seely: It will not be £45,000,000.

Mr. Joynson-Hicks: The primary necessity of the country is economy, economy, economy, even in the Air Service, which I have tried to increase so much in the past. One figure that my right hon. friend did not give—or, if he did, I missed it—is the number of pilots he intends to have in the future. He told us there were to be 102 squadrons, and, I think, 5,300 officers. I should like to know how many are to be devoted to staff work in London and other centres, and how many actual pilots he is going to have, because pilots are the backbone, and you cannot make them in an emergency?

Will my right hon. friend forgive me if I criticise one point with regard to military aviation, and that is the connection between the Air Service and the War Office. I think my right hon. friend, if I could see into his head, would rather agree with me. It seemed to me that, in dealing with the future of the Air Service, he was rather fettered by the fact that he was directed by the man who is also responsible for the Army as well as the Air Service. I cannot imagine why it was felt necessary to put my right hon. friend in command of these two Services. Here is a right hon. gentleman practically in the position of a Secretary of State coming here to-day and putting before the House an enormous Estimate of £66,000,000. He does not do it on his own authority, but according to the directions received from the Secretary of State for War. It is only a year ago that they made up their minds to have a separate Air Force, and to have a separate Secretary of State for Air. They did it after very careful consideration, and I believe I am right in saying that the present Secretary of State for War was a member of the Government which decided that it was necessary to have a separate Secretary of State for Air. He did not resign; he did not show that he disagreed with the Government. That was done when it was most difficult to accomplish it—in the middle of a great war. Even then it was thought to be necessary to have a separate Secretary of State, and if it were desirable to go through all the possibilities of disruption in bringing together the Naval

and Military Air Services, and all the trouble which we know there was in welding them into one Service during the War, now that they have fully justified themselves and the action of the Government, the Government go back and put my right hon. friend in as sole Secretary of State for the two Services.

What did my right hon. friend say the other day? He merely reiterated the Air Council's statement that:—

"The status of the Ministry is in no way changed; it remains completely separate and independent."

How can it be separate and independent when he is Secretary of State for War and he is on the top of the Under-Secretary? The Under-Secretary actually used these words in his speech to-day:—

"I have been directed by my right hon. friend to proceed to Paris."

There is independence! He cannot even proceed to Paris without being directed by the Secretary of State. What can the Under-Secretary do?

I want frankly to put this point. What are the preparations for an Independent Air Force? One of the greatest things done in the War was the work of the Independent Air Force under Genl. Trenchard, which had more to do with breaking the morale of the Germans than anything else on land or sea. Is that force going to be continued?

The Secretary of State for War (Mr. Churchill): Certainly! There will be an Air Force separate from the squadrons allocated to the service of the Army or the Navy.

Mr. Joynson-Hicks: Who is to be the controlling factor of that Independent Air Force? Up till now it was the Air Ministry; after now it will be the Secretary of State for War.

Mr. Churchill: No; it will be the Secretary of State for the Royal Air Force.

Mr. Joynson-Hicks: I want to ask, in dealing with civil aviation, in regard to the arrangement made by Genl. Sykes at the Paris International Convention: Will my right hon. and gallant friend tell us whether that has been taken into consideration in the draft treaty which was drawn up by the Civil Aerial Transport Committee some little time ago, which dealt very largely, and I think very carefully, with these subjects? I do not desire to press for details of the treaty, but if my right hon. friend can assure the Committee that the points raised in the draft treaty have been or will be considered before any final arrangements are made in Paris, I shall be satisfied.

I do trust that my right hon. and gallant friend will see that safe flying is not, as military flying undoubtedly was five or six years ago, fettered and hampered by too many restrictions, by too many examinations.

Lieut.-Col. Malone: The matters which I shall raise to-night are—firstly of principle, and, secondly, of detail. First, then, as regards the position of the Air Ministry. I do say, and I think the right hon. and gallant gentleman himself must know, that in the last few weeks the Admiralty have made an offer to the right hon. gentleman to sever the naval side of the Air Service from the R.A.F. I am sure he will not deny that. It is common knowledge. We cannot help hearing these matters, for any correspondence which comes from the Admiralty or the Air Ministry by way of the Strand is bound to be intercepted by the public. This seems to indicate to me some slight lack of co-ordination between the Ministers in charge of these Departments. The idea of severing the naval side from the Air Force as a whole is a small-minded point of view. We have already seen in the few results of the Independent Force what are the possibilities of a large, powerful, Independent Air Force. If there is another war it will probably be a very terrible war indeed. It is quite conceivable that the air side of it may commence by the launching of enormous flocks of bomb-carrying aeroplanes from the centre of some wild country, such as Russia. Those operations or counter-operations, or the offensive or defensive measures, cannot be said to be either really naval or military.

There are a great many other reasons why it is necessary to maintain an Air Service as a separate Service. There is the question of material. During the War the need for organising the aircraft industry was the primary cause which brought about the organisation of a separate Air Service. There is also the question of training, personnel, and providing equipment and stores.

Then there is the rather subsidiary point of meteorology. At present the meteorological services are divided among four Government Departments—the Admiralty, the War Office, the Air Ministry, and the Meteorological Office at South Kensington. It seems to me that is a question where, from an economical point of view, criticism might be brought to bear. What better Department could look after the elements than the Air Ministry?

Before we pass this Vote, I want to ask the Secretary for Air to give us a definite and binding pledge that so long as this financial year continues he will see that no attempt is made to sever the naval and military section from the Air Ministry?

There are one or two minor details I wish to deal with before I close. In the first place, there is the question of airships, which are at present "nobody's child." They are built by the Admiralty, the material is partly supplied by the Air Ministry, and the personnel is completely supplied from the Royal Air Force. That is a most anomalous position. It is detrimental to the efficient growth of what will now probably be a very important section of the Royal Air Force. You cannot apply to airships the argument which you applied to "heavier than air" craft, in respect to floats and wheels, because if any type of aircraft are amphibious, surely it is airships. The progress of airships in the War has not been very great. When the armistice was signed everyone will agree we were a very long way indeed behind the Germans in the development of airships.

Whilst I very much deprecate raising the question of any individual officer on the floor of this House, either male or female, I would just like to ask whether it is proposed to employ the services of that distinguished officer who was connected with the inception and development of airships. I understand he has been out of employment for a very considerable time indeed. I know the question of his re-employment has been constantly considered, and in justice to this distinguished officer's great career and reputation, I hope that it will be possible to come to a definite decision one way or the other as soon as possible.

There is another side to this question which has been dealt with briefly to-night, and it is the commercial side. Everyone who has spoken to-night has foreshadowed the enormous developments which will take place on the commercial side of aeronautics. Can this side be really efficiently developed as a side-show to the War Office? The developments in the War have been very great indeed, but developments of aircraft in the next few years will be very much greater. At the beginning of the War both the Admiralty and the War Office failed somewhat because they did not appreciate the association necessary between this and what we call the civilian nation. Consequently, at the beginning, the Admiralty had to divert energy that should have been employed in getting on with the War to organising the Mercantile Marine and the fishing fleets as an auxiliary service. Similarly the War Office had to disgorge many mechanics employed by them in order that the supply of munitions should not be lacking.

I look upon the development of civilian aircraft as so important that it ought almost to be the work of a separate Secretary of State. The Secretary of State for Air has indeed a magnificent opportunity to render a great and glorious service to civilisation if he will devote himself with special zeal to this side of his work.

Lord Hugh Cecil: I mainly wish to speak of the construction of the force and its expansion. The reason I am sorry that my right hon. friend the

member for Dundee (Mr. Churchill) has taken the two offices does not spring from any distrust of himself. I do, indeed, trust him much more completely as the War Minister than I do as the Air Minister, because I think he shares an infirmity very common among Englishmen, of thinking that the Air Service is a very easy thing to understand, and that, therefore, he understands it.

I shall never think that the Air Force is in a completely healthy condition until, and this cannot be for many years, it is possible to put it entirely under the authority of those officers who themselves have had experience in this War in flying in the air and combatant flying service in the course of the War. It is not until you get that generation grown up and attaining to a sufficient age to enable them to be in full command of the Air Force, that you will get it into a completely healthy condition.

That brings me to the next point. It is sometimes thought that you do good to the Air Force by importing senior officers from the Army to instruct them in discipline, and, of course, some of the officers other than those who have been regularly flying, are men of extreme ability, and have rendered extremely valuable service to the Air Force. Others may be described as disinterested examples of military eminence. But whatever their quality, some very bad, and some not so good, they must be regarded as a temporary expedient. It is quite true that flying officers commonly are very ill trained in administrative matters and by no means good Staff officers, and that without the assistance which the Army and the Navy has given, the Air Service would be very ill served in all the staff part of its work. Nevertheless, that must be a temporary expedient until you have trained up genuine flying officers and taught them staff work by proper training and education. Therefore, the great problem in the Air Service is the future training of the air officer. I do earnestly hope that every air officer in the future, whether administrative officer ultimately or flying officer, shall always begin by learning to fly. I am quite sure that that is essential for the efficiency of the Air Force.

Therefore, I earnestly plead for a scheme of training by which officers shall be trained, as they are in the Army and Navy, for the Air Force. They should be brought up to be airmen, and made in every possible way to feel a pride and pleasure in their Service, and regard for its honour and glory. At present there is no doubt that the Air Force is divided by a great schism. The officers who can fly regard, sometimes with patience and sometimes with impatience, but always with contempt, officers who cannot fly.

Mr. Raper: The full importance of the Vote before the House is not, I think, generally recognised by the public. Too many people are apt to look upon aviation, and especially civilian aviation, as a new toy for the Government to play with. The part, however, which flying, both civilian and military, is capable of playing in the future destinies of this country is so vast that the greatest care must be taken to avoid any possibility of mismanagement or mistakes at the outset. If the Government proposes to control not only military but civilian flying, every precaution must be taken to protect the latter from official lethargy, as well as from an excess of official zeal. Commerce has never thriven in fetters of red tape, and it is essential that commercial aviation should not be tied too tightly to the apron strings of Whitehall.

It is remarkable to me, as a business man, that adequate accounting arrangements were not made when aerodrome building contracts commenced. When it is borne in mind that there were no less than 300 contracts made for the construction of aerodromes ranging from £100,000 to £1,500,000, the serious need for expert commercial accountancy is amply demonstrated.

Take the system of contracting for construction work on a cost, plus profit basis. Unless controlled and carefully controlled by suitably qualified accountants with large commercial experience, such a system cannot but leave a very wide door open to corruption. I should be interested to learn why the system which was adopted of allowing the contractors a certain profit on materials supplied to them by the Government was made retrospective? Did not the Air Ministry think that these contractors had already made sufficient money out of the country for all the work they had undertaken? Another question I should like to ask my right hon. and gallant friend is how much has been written off as a charge against the public for stores deficiencies of squadrons stationed in Great Britain since the War began, and what percentage of this amount has been recovered from the officers responsible for such deficiencies? The whole system of provision during the War was most unbusinesslike, and I contend strongly that the position of Director of Air Equipment is a post to which an officer of good business experience should be appointed, and not a Service man who, however fine an officer, possesses no commercial experience. I should like, too, to receive an assurance from my right hon. and gallant friend that the break clause has been imposed in the case of all contracts which were in force when the armistice was signed for the supply of aeroplanes, engines, and spare parts, and that in no case has the imposition of this break clause been subsequently varied.

A post has been created called the Director of Production and Research, and an officer has been given this appointment who joined the R.A.F. in April, 1917. Is this officer under Genl. Sykes or Genl. Trenchard, and what exactly are his duties? Where has he had the business training which is necessary in the case of an officer who controls production, or the scientific training which is necessary in the case of an officer responsible for research?

Lieut.-Col. Moore-Brabazon: With the enormous Estimates that have been put before this House during the last week, I hope that the growing spirit of economy will not culminate against the newest Service of all; and it is on the matter of economy that I want to raise my voice from the point of view of organisation. The first matter is with regard to the operations side of the Air Force. That is a thing which has changed from day to day from the beginning of the War. We have seen that the R.F.C. started off to do nothing but reconnaissance, and ended up by taking a very large part in offensive operations. The same thing happened in the Navy. From doing nothing but scouting, it has changed to offensive operations against submarines. I want to get an answer from the right hon. gentleman as to the probability of establishing, now, an Air Staff, so as to train people to deal with this new weapon in the most efficient way possible. I have seen the use of aircraft right through the War, and I know the way it was done really. Anything new done by the R.F.C. was always very wonderful, and if you did not go quite what was expected of you, you turned round and blamed the Air Ministry. There is an enormous future, but it must be studied out, and the only place to study it out is in an efficient Air Service Staff College. Might I ask the right hon. gentleman if he can let us know, now, what policy he is about to adopt with regard to the importation into the R.A.F. of Regular officers from other Services? I should like to know where we stand with regard to that. We have found ourselves saddled with Staff officers, and with all sorts of Regular officers, who knew nothing about the subject at all, and who arrived at a minute's notice. I should like to get, straight away, to-night, a guarantee from the right hon. gentleman that this will not occur again; and that, if you belong to one Service, you do belong to that one Service; that you cannot be amphibious, and change about every half-hour. There is, I believe, a proposition that officers should be seconded from one Service, or from the Army to the Air Service, for a period of years, as was done in the R.F.C. before the War. I think the Secretary of State for War has it at the bottom of his mind that in that way they can get a knowledge of all the Services which will lead up to that dream of his, which is, I believe, an Imperial War Staff. Now, if we can second officers of the Army and Navy to the Air Force, will he give us an assurance that we can also second Air

Force officers to the Army and Navy. Otherwise, we shall soon see that when this big Imperial Staff College arrives the people who will be on top in it will be sailors and soldiers, and not airmen.

May I raise a point with regard to the pay of flying officers. I should very much like to be told, and for the Committee to know, what are the percentages of fatal accidents which arise, first of all, from the enemy, and secondly, through training. I think, if the figures were put before the Committee, it would amaze them to know what enormous casualties have taken place, not from the enemy, but through quick training and, perhaps, careless landing after a flight over the lines. I do hope the idea is going to be embodied in the new organisation of the Royal Air Force, that anyone who has any ability can rise really to the top, because I have heard rumours that the new Air Force is going to be a crack corps. Do let it be a crack corps of efficiency and not a crack corps of social snobbery. Can we be assured that the men who really are not soldiers, but tradesmen dressed up—you have to remember that that is the difference between the airman and the soldier.

We must remember that a war now is not brawn against brawn, but absolutely brain against brain, and the only way we kept ahead in this War was because we were relying on the civil side that was making our machines. It is up to the House, and to the civil side of the Air Ministry, to see that the best people in our wonderful corps are mounted on the very best machines.

The liaison between the man who is going to design the machine and the person who is going to use it in war I think presents a little difficulty, and I should like to have the scheme disclosed to me to-night.

I should like to say one word as to the future of aviation in general. Neither your Army nor your Navy nor the Air Service was able to come to a decision in this War. All three Services adopted defensive measures while the great inertia of the commercial possibilities of the country were developing, and when that was really organised and going forward nothing could stop us. If that is so, you only have to knock out the civil engineering part of the country and you could never win any war. I do not think hon. members have realised quite enough what bombing is going to come to in the future. The ordinary bomb of to-day is as the bow and arrow to the howitzer compared with the bomb of ten years hence, and we have seen even during this War that it is possible to sail your aeroplane to a definite point by directional wireless in a fog, and when you got to that point there is no defence against night bombing by directional wireless. That is a very serious thing. In the future it seems to me the only way of dealing with the situation is to have in your hands the possibility of hitting back a good deal more than you can be hit, and for that reason I hope the House will pass these first Estimates.

Sir D. Maclean: These Votes in effect really are nothing more than Token Votes. We do not know neither does the Government, what expenditure will really be required. I suggest that when the time comes, say in June or July, we might have an opportunity of reviewing these Estimates, because then we should have some idea of the position which lies before us.

Mr. Bonar Law (Leader of the House): I need not say I entirely agree with my right hon. friend that the present method in the present circumstances must be, if not unsatisfactory, at least disquieting to every member of the House of Commons. Of course we have had the feeling, and I gave expression to this while still Chancellor of the Exchequer, that the system of Votes of Credit, by which all this expenditure is paid for out of one Vote, was a very bad system even under the suspension of hostilities, not to speak of after the conclusion of peace. I, therefore, gave a promise that so far as possible the system of ordinary Estimates would be adopted this year. But the right hon. gentleman is quite right. Though we have a nominal system of Estimates, in effect they are really Token Votes, and what the House is doing is granting a sum of money which cannot be particularised, but which must largely be guessed either by the Government or by the House. Obviously that is very unsatisfactory, and I have not the slightest doubt that as soon as peace comes, as soon as we know where we are in that respect, it will be the obvious duty of the House of Commons to have some complete discussion on the question of policy as to our armed forces.

Mr. Perring: The Estimates are framed according to some hon. members as though we were at war, while other hon. members speak as though we were approaching peace.

If we look at the proposed Armistice terms, together with the Peace terms, we see that the German Army is to be stripped of aeroplanes, more or less, and will be practically helpless in a few months' time, while we, as a Great Power, are to-day stronger than we were when the Armistice took place on November 11. We have been told to-day of the large expenditure which has taken place between November 11 and the close of this financial year. In view of that fact, and in view of the large expenditure which the Government have been compelled to pass, having regard to the large contracts which existed on the Armistice day, I suggest that our Air Force will be so overwhelmingly strong, and our Allies will be so overwhelmingly strong, that there is not the same necessity in the ensuing financial year for this great expenditure. Reference has been made to the large Estimates for the Army, the Navy, and now the Air Force. I calculate that the sum asked for, at a time when we are approaching peace, and when our enemy is supposed to be prostrate, represents something like £50 per head for every family in the country. We have been told that the War is not over, and that we must be prepared and be cautious in what we are doing. I submit that such a suggestion is a very serious reflection upon the military advisers of the Crown in regard to the Armistice and the Peace terms, because if the Armistice terms permit of the enemy again resuming hostilities, or of having any prospect of resuming hostilities, it will be a very serious reflection upon them, and this House would have good cause to complain. I am content to believe that the military advisers of the Allied Powers have made such terms that there is no possibility of the resumption of hostilities, and that, having regard to the fact that we are overwhelmingly strong and the enemy is extremely weak, we need not speak in this House as though we were in the midst of war.

I think it is desirable that everything should be done to develop aviation, and that everything should be done to meet the needs of the defence of the country, but I do suggest that if we encourage commercial aviation it would be the best thing.

Mr. Bartley Dennis: For the next few years I suppose members of the House will be apprehensive concerning the question of economy, and I would like to refer to the speech of my hon. friend Mr. Perring, and his criticism of what he thought was the extravagance of the present Estimate. But it is impossible for any of us to criticise these Estimates because there are no details. I could a tale unfold about the aerodrome that would exceed in horror all that has been said this evening by several hon. members—the aerodrome at Uxbridge, where I live, and the conversion of Oldham Mills into aeroplane factories. On one occasion a deputation of Lancashire builders waited on Lord Rothermere about the cost and he said that he was perfectly helpless in the matter, that there was no method of payment for these aerodromes except a percentage on cost of material, labour, and establishment expenses—the most ruinous kind of contract that either a private individual or a Government could go into.

Maj.-Genl. Seely: The principle on which we propose to act in the Royal Air Force in the future is the same as that for which the R.F.C. was first formed, namely, that everyone in the force shall learn to fly, and the future of the observer will then be found after he has flown probably, and not before. Of course it may be said that there are some administrative services which cannot be filled by flying men. I hardly believe that that is true.

The Report of the Civil Aerial Transport Committee has been largely the framework on which we have founded all our proposals.

"All recent speakers have urged the importance of economy," but none, I think, has suggested that these particular Estimates are too high. Some have suggested that there has been waste in the management of aerodromes. I dare say that may have been so. In fact, we know that in one case a very important and impartial committee found there had been great waste. I welcome the knowledge that they bring to me of any occasion where there is wasteful or extravagant administration. Not only do I welcome it, but I invite it, and I hope any hon. member in this House who believes there is anything wasteful or uneconomical being done will bring it to my attention.

I much regret that I was absent from the House for a few moments when the hon. member for Leyton (Lieut.-Col. Malone) was speaking, but I understand he said the Admiralty objected to the present position of the Air Force and wanted to withdraw their Force. That is not the case, so far as I know; it is new to me. I do not believe the Admiralty have any idea of doing any such thing. I am quite sure that they, in common with the War Office, see clearly that the only way to administer an Air Force is by an Air Ministry, and I can only repeat what my right hon. friend would, I know, have said if he were here, that his holding both offices does not in the least mean that the independence of the Royal Air Force and the Air Ministry is in any degree jeopardised. Quite the contrary. The fact that my right hon. friend is so keenly interested in flying himself, and was one of the first to encourage it—he has, I believe, with the exception of myself, flown more than any other member of the House, except of course those gallant professional officers we have with us—is a proof that he is not likely to allow the Air Force to lose a jot or tittle of its independence. My hon. and gallant friend the member for Chatham made a most interesting speech and begged that the Royal Air Force should not be put under the heel of unsympathetic, unscientific, and occasionally incompetent Staff officers from the other Services. I give him with the greatest pleasure the assurance that he requires.

May I say that we do realise that the airman is a different being to the sailor or the soldier. He has a different outlook on life. He believes that he should have his own Staff college, and he shall have it. He considers that there should be an Air Staff just as much as there is a General Staff at the War Office or a General Staff which is being created at the Admiralty. With those who think that there should be one great Defence Ministry, I may say that the necessary step to that end would be that matters which appertain to the air should have a department even more than any other department, and a staff of its own, so as to make those concerned feel that their contribution of flying to the other two links them together very, very closely. I understand that the hon. member for Leyton indicated, or, rather, it might be gathered from his speech, that he thought that Genl. Sykes was in some way superior to Genl. Trenchard and directed him.

I am glad to take this opportunity of saying what I intended to say in my opening statement on that subject. Of course, that is not so. There are three members of the Air Council, Genl. Trenchard, who commands the military side; Genl. Ellington, who is responsible for the production and research side; and General Sykes, who, as everyone knows, is the Controller-General of Civil Aviation. None of them can be said to be the boss of the other, to use homely words. Certainly, the last thing Genl. Sykes or Genl. Trenchard wish to do would be to say that the one was superior to the other. The line of demarcation of their spheres is quite clear. I know that they will work in cordial co-operation together for the benefit of flying. What I am anxious to say is that we owe a great debt of gratitude to Genl. Trenchard for his services during the War. That has been given expression to, I think, before. But it would not be proper in introducing Air Estimates not to refer to them. The Independent Air Force which, of course, would form part of our fighting forces if ever we went to war again at once, was under his command, and had a vital effect in bringing the War to a victorious conclusion. The fact that he at once, when asked to come forward, to take over his present duties again, did so, places the Government and the country in his debt. I regret to say he has been seriously, not to say most dangerously, ill. I was glad to hear this morning that he was better and with every hope of a speedy recovery. I am sure the whole House will wish well to both Genl. Sykes and Genl. Trenchard. Genl. Sykes, who takes up this most difficult and new post, and Genl. Trenchard who took over at a most critical time.

I am glad to say that all the senior officers of Genl. Sykes' staff have been selected, and that the whole staff is in process of formation. I have every hope that in a very short time the whole thing will be in working order. In the meantime I must admit that owing to the influenza having laid by General Trenchard and myself, and both having to be consulted in the allocation of these posts earlier through the temporary indisposition of Genl. Sykes, but most probably due to my fault in catching the influenza, there has been delay.

Mr. Joynton-Hicks: Will it be a purely military or civil staff?

Maj.-Genl. Seely: There will be military and civil officers. Most of the posts, if not all, will be filled by officers of the Royal Air Force who have been in it, because, during the War, everybody who could fly or took an interest in flying joined the Force if he was young enough to do so. But it is not intended that it should be a military organisation in any sense of the word. So much is that the case that Genl. Sykes asked to be allowed to retire from the Air Force in order to emphasise the civilian aspect of his duties.

Lord H. Cavendish-Bentinck: I beg to move to reduce Vote A by £100.

I have put this motion down to draw attention to the dismissal of Miss Violet Douglas Pennant. I should like to explain that I am very sorry indeed to have to say anything that is disagreeable, firstly, to my right hon. and gallant friend, and, secondly, that may seem to be derogatory to the Air Service. The right hon. and gallant gentleman is a very old friend of mine, and nobody has a greater admiration for the distinguished services rendered to the nation by him or the Air Service. This question is not merely a personal one. The dismissal of Miss Douglas Pennant goes to the very root of the efficiency of the public service, and the treatment which was accorded to her really undermines that confidence which justice and fairness ought to inspire. Miss Pennant was ostensibly dismissed because of the exigencies of the public service, and the excuse given is because the efficiency of the Service demanded it. That is merely the ostensible reason, but the real reason is that she from the very first was the victim of a conspiracy and an intrigue, and Lord Weir, instead of supporting her in her efforts to secure the efficiency of the Service, got rid of her, and thereby supported and condoned the action of those who were obstructing the efficiency of the public service.

Miss Pennant was no untried person. She had a long and distinguished career of public service, and her efficiency and capacity as an Insurance Commissioner has won for her the affection and esteem of the whole of the people of Wales. On April 22 she was invited to take the head of the Women's Royal Air Force, and she only consented if she might have an opportunity of looking round for a month. She found she was up against a corrupt clique of people who were running the Women's Air Force at that time, who were determined that it should be run in an inefficient way or not at all. For instance, she was refused all information as to the Service over which she was supposed to preside. She was even refused information as to what camps had women of the Royal Air Force working in them. She went to the Master-General of Personnel and told him that she could not possibly accept the post unless she had his support, and Sir Godfrey Paine promised her his support, and said she was to have the sole command of the Air Force, and at all times to have access to himself. Therefore she accepted the post.

Soon after she was asked to promote five most unsuitable and inexperienced women to high and responsible positions, but she refused to do so and said they must take subordinate positions in which they had proved their worth. Lord Weir upheld her decision, but this caused great discontent and animosity in the clique to which I have referred, and they made it their business to make her position impossible. She got messages to say that she would be very soon turned out of the place, and stating that highly-placed people were determined that she should not hold her position any longer. These people actually went to the length of issuing instructions in her name without her knowledge, and behind her back, with the sole object of making her out a most unreasonable person. Telephone messages were sent in her name of which she had not the slightest knowledge, and she went to Sir Godfrey Paine and said she could not possibly carry on her work unless a certain officer at the head of the men's department of the Women's Air Force was dismissed. Sir Godfrey Paine, who always supported her in the most loyal way, got rid of this officer, and for a time everything went smoothly and the Service made great progress.

Unfortunately, Sir Godfrey Paine took up a position in France, and Genl. Branker took his place, and he had not been in office more than three days and had hardly had time to see whether Miss Pennant was efficient or not, when he sent for her and dismissed her on the spot. I do not know whether he did so by Lord Weir's order or not, but she was dismissed in an extremely summary manner. I think probably my right hon. friend will tell us that since Miss Pennant was dismissed, and since her successor has taken over her work, things have gone on much more smoothly than before. That may be the truth, but it is not the whole truth. The whole truth is that when Miss Pennant took up this post she found the Women's Royal Air Force was a perfect mess of corruption and intrigue, and the whole Service was in an utter state of disorganisation. Although there was a large staff they had done absolutely nothing. There was no register, no system of finding letters, and what is more important there was no clothing to be got for the women. There were actually 500 camps in which women were working, and only 73 women officers, and Miss Pennant fought against the difficulties placed in her way, and proceeded to put these things right.

She secured accommodation for training officers, and in 11 weeks she trained no less than 300 women officers, and, further than that, she started a training scheme for 12,000 cooks, and typists, and general servants. It would be more honest to say, and I hope my right hon. friend will say, that the efficiency of the Service of the present day, to a very large extent, is due to the excellent spade work put in by Miss Pennant when she was there. I think it is really deplorable that she was not allowed to carry on her work.

I know perfectly well that in war-time no officer has a vested interest in his post. We have seen officers got rid of, not for any misconduct, but simply and solely because the exigencies of the Service demanded that somebody else should have that position. I do say, however, that Miss Pennant was not dismissed for any inefficiency or unpopularity, but she was dismissed simply and solely because she was not allowed to have a fair chance, and because she was up against this corrupt clique of people who put every obstacle in her way. She was the victim of malice, intrigue, and conspiracy, and I think it is a monstrous thing for a Department to say either that she was unpopular or inefficient, because she was neither one nor the other. Lord Londonderry, in another place, speaking for the Air Ministry, said that if charges of corruption and intrigue were made, Miss Pennant should have an inquiry. Well, she has brought charges of corruption and intrigue against members of the Ministry. I myself bring charges of corruption here and now, and it will be a monstrous thing if the pledge which Lord Londonderry has given in another place is not upheld and given by the Minister now.

The amendment was strongly supported by Brig.-Genl. Sir O. Thomas, Sir Robert Thomas, Mr. Hinds, Sir David Davies, Mr. Thomas Davies, and Mr. Harold Smith.

Maj.-Genl. Seely: We have been asked two definite questions. The first was, Who told Genl. Branker to dismiss Miss Douglas Pennant? The answer is Lord Weir told him to do so. He takes the full responsibility. He says that he carefully considered who was the best person. He thought Miss Violet Douglas Pennant was the best person until, as time went on, he came to the conclusion that, hard as she was trying to do her best, competent as she was in other respects, she was not the best fitted for this position. He was quite sure about that. He took the fullest responsibility. The next question is, What is the charge against Miss Douglas Pennant? There is no charge against her. There is the opinion of the competent authority of that day, long ago, that, although far from there being a charge against her she was one of the best and most patriotic, one of the most competent and efficient ladies in England or Wales, she was emphatically not the best fitted to be the head of the Women's Royal Air Force. I have said what I have said, not out of compliment to her, but because it is manifestly true. But I wish my hon. friends around me would see that it really must be open to the Secretary of State to decide who are the best people to fill particular appointments. It cannot be said that if anyone is told, "You must go back to your other position" you must have an immediate inquiry. It would be utterly subversive of all discipline. I ask the House to support me in saying you cannot allow that to be said. There are not words strong enough to say how highly I regard Miss Douglas Pennant and the services she has rendered to the State, and I know Lord Weir would say the same if he were standing in my place. In the most difficult and very peculiar job of administering this Women's Royal Air Force we came to the conclusion that she was not the best fitted for it. The State must have power to do that. If there is to be an inquiry as to whether Lord Weir was right in superseding this most admirable lady because he believed another lady could do it better, and we would get on with the War better, I say No.

If a specific charge is made that this lady was best fitted for the job, and that there was malice or corruption on the part of anybody from the Secretary of State downward, and if a *prima facie* case is made out we will at once order an inquiry into that specific allegation. But be it clearly understood that the question of the right of the Secretary of State in his unfettered discretion to remove anyone at any time, and especially at a time of war, to supersede anyone, we cannot have inquired into. The true answer to that is to bring the Secretary of State to the Bar of justice in this House, or if there be malice or corruption shown, to bring him to the Bar of an appropriate tribunal; but to inquire into his right to supersede anyone would be fatal to good government.

The discussion was continued by Sir F. Banbury and Mr. Thomas.

Mr. Churchill: The House has taken a great interest in this important personal case, and one can easily see by the attitude of many of those who are present that they have already, to a very large extent, made up their minds as to what is the proper course for the Government to take. I have heard a lot of personal cases debated in this House at one time and another, and I have often noticed how keen is the interest in those cases, and how very distressing they are to hon. members who hear the whole story unfolded rapidly to them of some wrong which has been done, some injustice which has been committed. It is not, I think, upon details, but only upon general principles that the House should consider how it will deal with a matter of this kind, and I fully admit that my right hon. friend, in the speech which he has just made, did confine himself in the main to general principles.

Let us just see what are the main principles which are involved. In the first place, there is the question whether the discretionary powers was rightly used. In the second place, there is the question whether there is any allegation that the discretionary power was corruptly used. Let me take the

first aspect. There are, it seems to me, three matters which are more or less common ground on both sides of the House. First of all, it is common ground that the condition of affairs in the Women's Royal Air Force in the six weeks or month preceding Miss Douglas Pennant's departure was not at all satisfactory. That is common ground. Secondly, there was a good deal of friction between Miss Douglas Pennant and some of her subordinates, between her Department of the Ministry and other Departments of it, and between the Air Ministry as a whole and the Ministry of National Service, with which the affairs of the Air Ministry were greatly intermingled, because, as most hon. members know, the Air Ministry was dependent upon the Ministry of National Service for the recruiting of the Women's Royal Air Force, in the same way as the Army and Navy were for the other two branches of the Women's Auxiliary Force. There was a good deal of friction over the whole of that area. Things were not going well. That also is common ground. If it is not common ground, it is indisputable. But the fact is that, after Miss Douglas Pennant had been superseded and certain changes in the organisation had been made, there was a swift and marked improvement all round in the condition of the Women's Royal Air Force, in the smooth working of the Air Ministry, and in the relations between the Air Ministry and the Ministry of National Service. That, again, I should suppose, was common ground. Of course, all these basic facts are capable of being viewed in perfectly different lights. The condition of affairs may have been bad! Miss Douglas Pennant was putting them right! There was friction in these efforts, but this was inseparable from her measures of reform.

Lord Weir took the view that Miss Douglas Pennant, whatever her qualities and gifts might be, was not the best official to bring the Women's Royal Air Force into good order. He thought that her methods were not the best, and that her relations with her subordinates and other branches of the Ministry were an impediment to reform.

It does seem to me a perfectly comprehensible course of action that a Minister carrying on a great Department and having relations with high officials, man or woman, a high official of consequence, and engaged in measuring from day to day what is the best course and the best policy in the interests of the Department, may in the event of a great deal of friction uphold that official to a certain point, and then, on further information coming in, or on further consideration of the subject, decide that after all it is better to make a change. That happens even in political circles.

I do feel that it is a perfectly reasonable assumption that Lord Weir found himself confronted with a succession of difficulties, people complaining, and so forth, and he supported those people until at last he said, "I shall not support them any more, and I am going to make a change." That may have been a harsh decision, but it is a perfectly reasonable and comprehensible one in time of peace or in time of war. Lord Weir, after informing himself personally, as he was bound to do in an important matter like this, through every channel he could, decided that Miss Douglas Pennant should be superseded. He did that in the interests of the Women's Royal Air Force, and he put somebody in her place in order that the interests of the Force might be advanced, and that we might get on with the War as quickly as we could. That is the view Lord Weir took. It is most important that the Committee, at the outset of this Parliament, should proceed on sound principles in regard to these cases, which are so very numerous.

Lord Weir was the person responsible. He was the man who ought to decide, had a right to decide, in fact it was his duty to decide, and he was bound to do what he thought was right and best at the time in the interests of the Force.

I thought it right to ask Lord Weir to express his views on this question in view of the debate. I received this letter from him, and, with the permission of the Committee, I should like to read it:—

"MY DEAR CHURCHILL,—I have received from Sir Arthur Robinson your Minute of the 7th March, asking for my views and attitude with regard to Miss Douglas Pennant.

"I have gone carefully over the case, so far as my recollection stands, and with the documents in front of me, and I cannot see anything to cause me to regard my letter of the 4th December to the Prime Minister as not covering the entire situation.

"There is one point which might be made clearer in view of the discussion in the House of Lords. Genl. Brancker had practically nothing to do with Miss Pennant's supersession other than as my instrument in informing her

of our decision to replace her. His opinion was not asked, as he had only just taken up his position, and any belief that Genl. Brancker brought about the supersession is unfounded.

If Sir Godfrey Paine had still been in office my decision would have been the same, but Genl. Paine would have drawn my attention to his verbal promise of the further months' trial which has been referred to and as regards which I have expressed my regret.

"Genl. Brancker simply did what he was told, although I am, of course, not aware of the exact wording of his statement to Miss Pennant.

"I wish to make it quite clear that I was in every way personally responsible for this decision to supersede Miss Pennant, and the whole circumstances are given in my letter of the 4th December. I utterly fail to see what more there is to inquire into. An inquiry into the conditions of the Women's Royal Air Force at the time would only show that it was not going well. It might even possibly show that Miss Pennant had been doing good work, but that would not alter the facts, which are that, rightly or wrongly, I came to the conclusion that she was not the right woman to pull the show round quickly, and, accordingly, she was superseded. I cannot see any mystery about that.

"I am very sorry indeed that you should be worried with this legacy, but speaking very frankly, I feel that I did the right thing for the Air Force, and I would do the same to-morrow in the same circumstances, with the single exception that I would have expressed my regret to Miss Pennant at breaking the verbal arrangement which Sir Godfrey Paine proposed as regards the month. In regard to this, I have already expressed my regret at my omission."

I do ask the House to support the Government in the position we take up. There are thousands of cases where people in this War have left the public service or have been removed from their appointments with a feeling of intolerable injustice, and I have no doubt, in a very large number of these cases, if all the circumstances could be reviewed before some supreme, august tribunal, and if all the facts at the time had been known, it would be admitted that they had had very hard treatment and very painful usage. But we had to get on with the War. The need of organising this Women's Air Force in a satisfactory manner was a vital operation of war at a time when we were short of men and it had to be dealt with as it was a rough, hard, crude operation of war. There is no charge of any kind whatever against Miss Douglas Pennant. Every possible compliment had been paid to her character and to her capacity. Nothing has happened and nothing has been said on behalf of the Government that prevents her from being regarded in her proper sphere as a competent and capable administrator, and there is not the slightest reflection upon her character. There was no reason whatever why she should not resume her public work or should not now resume it. At that particular moment she had, in the opinion of the sole man whose duty it was to judge for the time being, lost her usefulness in that sphere of the public service. On the other hand, I cannot, on behalf of the Government, agree to any inquiry except within the limits and under the conditions which I have specified, namely, that definite charges of malice and corruption are brought on reasonable grounds against named persons who take real responsibility for her supersession.

Mr. Thomas: If the right hon. gentleman has the report of the hon. member (Mr. Harmsworth) can the House have that Report?

Mr. Churchill: I cannot say anything, but I will inquire. I have read the Report, and I do not, myself, see any reason from the point of view of the Government, but it is a private and confidential Report made to the Prime Minister, and I cannot say anything without an opportunity of finding out what the Prime Minister says. That Report recommended that there should be a judicial inquiry, but the Prime Minister, after hearing what Lord Weir had to say about it in his letter of December 4, decided that it was not right or necessary to press the inquiry, and he accepted the views put forward by the Secretary of State for the Royal Air Force. That is the position, but without making any pledge on the subject I should be quite ready to inquire of the Prime Minister whether he would allow a document, essentially of a private nature, only written to oblige him personally in the course of his public work, to be published.

A nend nent negatived.

Original question put, and agreed to.

Resolution to be reported To-morrow Committee to sit again To-morrow.

QUESTIONS IN PARLIAMENT

R.A.F. Officers' Discharges

Mr. JOYNSON-HICKS, in the House of Commons on March 10, asked the Under-Secretary of State to the Air Ministry whether wholesale discharges of officers in the R.A.F., against their will, are now being made; and when he will be in a position to make a statement as to the future needs of the force in regard to men and officers?

Maj.-Genl. Seely: The officers who are being demobilised at present are those desirous of discharge. I shall hope to be able to make a statement as to the future needs of the R.A.F. in officers and other ranks when the Estimates are taken.

Demobilisation Gratuity

Mr. JOYNSON-HICKS asked the Under-Secretary of State to the Air Ministry whether a distinction is made on demobilisation between those officers of the R.A.F. who are ex-R.N.A.S. and those who are ex-R.F.C. officers; whether the ex-R.N.A.S. officer receives 124 days' pay as gratuity for the first year of service and 50 days' pay for every other year's service; but the ex-R.F.C. officer receives the same for the first year and 62 days' pay for the other years; and why there is this difference in the gratuity of officers doing similar work in the same Service?

Maj.-Genl. Seely: Both temporary ex-R.N.A.S. officers and ex-R.F.C. officers receive on demobilisation the same rate of gratuity for the period of their service in the R.A.F. The period of their previous service in the Navy or Army is rated for gratuity according to the Regulations of the Admiralty and War Office respectively. The rates for the Navy and Army are as stated in the question.

Controller of Civil Aviation

Mr. JOYNSON-HICKS asked the Under-Secretary of State to the Air Ministry what salary is being paid to the Controller of Civil Aviation; what staff he has; whether the new Regulations have yet been issued; and generally when he can make a statement on the subject?

Maj.-Genl. Seely: The salary and staff arrangements for the Controller-General of Civil Aviation are being considered by a Committee appointed by the Secretary of State to advise him as to the reorganisation of the Air Ministry, and their recommendations will be furnished at an early date. By regulations I understand my hon. friend to refer to the orders to be made under the Air Navigation Act, 1919. Conferences as to these orders are still in progress with representatives of the aircraft industry. I shall hope to make a general statement when introducing the Air Force Estimates.

National Aircraft Factories

Mr. KELLAWAY has circulated the following statement, pursuant to the promise given:—

The number of National Aircraft Factories erected or purchased by the Ministry of Munitions is ten. All of these factories were completely finished and were engaged in production for some months prior to the armistice. The approximate cost of these establishments is £2,261,300.

London-Madrid Proposed Flight

Mr. LYON, on March 11, asked the Secretary of State for War why, if it was considered that the postponement of the announced flight of military aeroplanes from London to Madrid was advisable, in view of possible transport difficulties in connection with the preparations required for any flight of this kind the official reason for the postponement given to the Press was "the disturbed conditions existing in Spain"; and whether the official announcement published in the Press the following day (namely, March 7), that "as the reports of the disturbed conditions of Spain had been proved to have been greatly exaggerated it is hoped to proceed with the proposed flight in due course," was made after representations by the Spanish Government that the initial statement was incorrect inasmuch as there were never any disturbances in Spain which would interfere with such a flight.

The Under-Secretary of State for Air (Maj.-Genl. Seely): The Ministry of Shipping represented to the Air Ministry that considerable delay was probable in the delivery of the special petrol, oil and spares necessary for this flight owing to disturbed conditions in Spain. It was accordingly decided to postpone this important flight pending the receipt of further information. The Spanish Government having informed us that there are no disturbances calculated to prevent the arrival of the necessary materials, arrangements for the flight are now being proceeded with.

R.A.F. Orders

Col. YATE asked the Under-Secretary of State to the Air Ministry whether he will communicate Air Force Orders to the Press on the same conditions as Army Orders and Army Council Instructions are communicated under the authority of the Secretary of State for War?

Maj.-Genl. Seely: Air Ministry Orders are published in a weekly series, and, following Admiralty precedent, are not generally issued to the Press. I am considering what further steps can be taken to issue to the Press such orders as are of special general interest or importance.

Nets to catch Enemy Aircraft

Maj. LANE-FOX, on March 13, asked the Under-Secretary of State to the Air Ministry if he can state with whom the idea of suspending entanglements for hostile aircraft originated; what reward, if any, has been paid to him; and whether he is aware that a suggestion of this invention was received by the Air Board in 1914, and was rejected as being useless?

The Under-Secretary of State for Air (Maj.-Genl. Seely): The method of suspending entanglements from balloons which was adopted in 1917 was taken from designs used in the defence of Venice, and the credit for the inception is due to the Italian Government. A proposal for the use of entanglements hung from balloons was first patented in 1913, and several hundreds of proposals of a similar nature were received during the War. It is not considered that any reward was due to the originators as the value of the proposals depended entirely on the methods devised for carrying them into practical effect. The Air Board did not come into existence until May, 1916, and it is not possible to identify the particular proposal referred to in the last part of the question.

Maj. Lane-Fox: Is he aware of the statement made in the Press and elsewhere that it was a distinguished officer in the Air Service, and can that now be definitely contradicted, in view of the dissatisfaction caused to a great many gentlemen?

Maj.-Genl. Seely: I presume all this happened while I was away from this country. I will make inquiries, and will make some such statement if facts are as stated.

Aeronautical Plywood

Sir HERBERT NIELD asked the Chancellor of the Exchequer if he will state who is responsible for the Regulations considered to be necessary for the realisation of the stocks of aeronautical plywood in this country at the date of the armistice or contracted to be purchased by His Majesty's Government at that time; whether he will cause inquiries to be made of the S.M.7 Department (Aircraft Supplies) as to whether any and what offers were received by that Department for the purchase of the entire stock referred to; whether, on January 28 last, a firm offer extending over three weeks was received of 47s. 6d. per 100 sq. ft. for the purchase of such entire stock; if he will state whether, on the intervention of the Timber Controller or that of some other and what controller, the provisional arrangements made by the

S.M.7 Department (Aircraft Supplies) to accept the offer above referred to were overruled; if he will state whether 2,500,000 sq. ft. were placed by the Timber Controller with Messrs. Foy, Morgan and Co., timber brokers, for disposal; whether Messrs. Foy, Morgan and Co., in the absence of any adequate accommodation for the storage of the plywood at Liverpool, stacked the same in open sheds and that, consequent on weather conditions, the value has deteriorated; and if he will likewise state the amount of loss occasioned to the Treasury consequent upon the cancelling of the provisional order previously referred to?

Mr. Bridgeman: I have been asked to take this question. The Ministry of Munitions is responsible for regulating the disposal of surplus aeronautical plywood which is being carried out under the Timber Controller, who is also Controller of Surplus Timber Disposal under the Surplus Government Property Disposal Board. Certain offers were received for the purchase of the entire stock referred to, including an offer in the terms mentioned in the question, but no provisional arrangements were made by S.M.7 Section of the Aircraft Production Department to accept that or any other offer. With regard to that offer, the Timber Controller was consulted, and, as the price offered was less than half the c.i.f. cost to United Kingdom port, he considered that it would be unwise to accept the offer before asking other manufacturers and dealers to tender for the plywood. The Aircraft Production Department agreed, and the offer was refused.

Considerable quantities of plywood have been placed with Messrs. Foy, Morgan and Co., as brokers, and have been stored in Liverpool and London. A representative who has just returned from Liverpool states that the goods have been properly stored in dry warehouses, and have not deteriorated in any way. No loss has resulted from the refusal of the offer referred to. I may add that it has been decided that publicity should be given in every case as to the disposal of surplus Government timber, and that, where possible, sales should be by public auction or public tender.



Newspapers by Aeroplane to Bournemouth

THE new single-seater Nieuport "Nighthawk," fitted with 320 h.p. A.B.C. Dragonfly motor, had its first long-distance test in the early morning of Friday, March 14. Piloted by Mr. Leslie Tait-Cox it made the 90-mile passage from Acton Aerodrome to Bournemouth in 50 minutes, carrying as ballast a special late edition of the *Daily Mail*. Mr. Tait-Cox would have made even better time but for a patch of fog which obliged him to make a circuit out to sea before landing. He left Acton at 6.25 a.m. and landed at 7.15 a.m. The machine was designed principally for swift turning and rapid manoeuvring, and has a radius of 240 miles. Photos. and a brief description of the machine appeared in *FLIGHT* of January 16.

Record Flights by U.S. Flying Boats

Two American flying-boats of the F. 51 type, each equipped with two 400 h.p. Liberty motors, on March 12 flew from Hampton Roads to New York, covering the 300 miles in 270 minutes. Each machine carried seven passengers and a gross load of 13,000 lb. One engine gave trouble, but it was set right in mid-air by a mechanic.

A Pan-American Air Show

THE Aero Club of America is organising a Pan-American Aeronautic Exhibition to be held between May 1 and June 1 inclusive, at Atlantic City. Daily contests will be held, for which valuable prizes will be offered. Not only will regular aeroplane and seaplane flights be arranged, but also tests with balloons, hydroplanes and parachutes. It is also proposed to organise a competition for "aviettes," i.e., bicycles and motor-cycles fitted with wings.

The exhibition will embrace every old and new aeronautical craft known, as well as safety appliances, and all the latest models and designs of inventors.

Long-Distance Wireless Telephony

IN connection with the experiments in wireless telephony which are now being carried out in the United States, it is stated that Mr. Daniels, Secretary of the United States Navy, recently was able to talk by wireless telephone from his office in Washington to Ensign Harry Sadenwater, who was flying 150 miles away from Washington to Hampton Roads. United States naval officers believe that this is the first time telephone communication with an aeroplane at so long a range has been accomplished.

An Aerial Ambulance

THERE have been many demonstrations of the possibilities of using aeroplanes as ambulances, and an actual instance of such use is now reported from New York. Lieut. David Gray, a convalescent R.A.F. aviator wounded overseas, was brought by a flying-boat from Rockaway to St. Luke's Hospital in 49 minutes. Lieut. S. Stevenson, of the U.S. Naval Air Service, was the pilot, and Nurse Helen Bastedo, of the Women's Motor Corps of America, was a passenger. An ambulance was waiting at the landing-place to take the officer to hospital. The fastest time made by motor corps ambulances between the same places is 1 hour 15 minutes.

To Boom U.S. Victory Loan

AN announcement by the U.S. Treasury states that three

flying circuses of aviators will tour the United States, giving sham battles in the air and performing acrobatic feats over the principal cities, as a feature of the Victory Loan campaign, which opens on April 21. The three circuses will be composed of American, British, and French aviators. They will fly American planes and captured German Fokkers, 14 of which, captured by Gen. Pershing's men, have been landed in New York and Newport News. Some American machines will also be used to show American aircraft development.

An American Ace Killed

FROM a brief message from Dayton (Florida) it appears that Major David Peterson, who was an ace in the Lafayette flying squadron in France, and accounted for 23 German aeroplanes, fell a distance of 75 ft. while flying there on March 17, and was killed. Lieut. Paversick, his fellow-passenger, was seriously injured.

Exploring the Sahara by Aeroplane

A GREAT amount of useful information has been obtained by a military reconnoitring expedition, consisting of four aeroplanes which proceeded from Algiers towards the centre of Sahara at the end of January, and has just returned. Altogether the aeroplanes covered 1,875 miles, of which 625 miles were over trackless regions.

Dutch Aircraft Show

THE enterprising committee which is organising the aircraft exhibition at Amsterdam from July 5 to 28, has approached Messrs. Vickers with the object of arranging an air service between London and the Hague, during the time the exhibition is open. The exhibition will be divided into the following 16 sections:—1, historical group; 2, department of war; 3, Navy department; 4, ordinary aeroplanes; 5, seaplanes; 6, motors; 7, motor-cars and motor-cycles; 8, aeroplane-building, with separate parts and tools; 9, photography, maps, and literature; 10, telegraphy and telephone; 11, orientation and lighting; 12, implements; 13, meteorology; 14, experimental aeroplanes; 15, medical branch; 16, clothing, equipment, and heating. It is hoped that British and French firms will be among the exhibitors.

German Seaplanes for Holland

A REPORT is current in Amsterdam to the effect that the Dutch Government has purchased 30 of the most modern type of German seaplanes from works in the neighbourhood of Kiel, to be delivered very shortly. These machines are probably intended for an air service to England, which is under consideration.

Dutch and Commercial Aviation

THE Dutch Government are taking a lively interest in aviation, and at a conference of Government officials held at The Hague recently it was decided to send a Commission to Great Britain, composed of MM. Colyn and Westerveld and a representative of the Ministry of the Colonies, to discuss the question of aerial services as well as mail and passenger traffic between Holland and her colonies. The result of this discussion in London will constitute the basis of plans to be drafted by private individuals, as it is intended to leave the development of aerial traffic to private enterprise.

Personals

Casualties

Maj. RUSSELL H. FREEMAN, M.C., R.A.F., who was reported missing on July 21, 1918, and is now presumed killed, was the fifth son of Mr. W. R. Freeman, of 103, Westbourne Terrace. He was born in 1894, and educated at St. Christopher's School Eastbourne, Winchester, and Christ Church College, Oxford. On the outbreak of the war he obtained a commission in the Worcestershire Regt., and went to France on January 1, 1915. He was invalided home with paratyphoid in the spring of that year, and after recovering he joined the R.F.C. He went to Egypt in June, 1916, where he earned the M.C. and the Croix de Guerre, and returned to England in June, 1917. He was last seen flying in the direction of Belleau in the evening of July 21.

Capt. ARTHUR FOSTER, R.A.F., formerly Lieut. 5th Manchester and 2/6 Gloucesters, who died on February 20 at the age of 22, from pneumonia following influenza, was the son of Mr. and Mrs. W. Foster, Poole.

Capt. CYRIL E. S. RUSSELL, R.A.F., who died on March 5 at Cologne, at the age of 31, of pneumonia following influenza, was the husband of Doris Russell, of 4, Woodlands Road, Littlehampton, and third son of Mr. and Mrs. W. W. Russell, of Court Lane, Dulwich, S.E.

Married

Maj. E. H. KAVANAGH BONE, R.A.F., of The Grange, Hever, Kent, was married on March 10 in London to MARGARET LOUISE THOMAS, of 31, Buckingham Gate.

Lieut. DUNCAN MACLAREN, R.A.F., only son of the late Mr. D. L. S. MacLaren and Mrs. MacLaren, of Brockenhurst, was married on March 11, at St. James', Emsworth, to RUTH ESMÉ PARKES, third daughter of the late Mr. Alec. Parkes and Mrs. Parkes, of Enderlie, Emsworth.

Maj. T. W. MULCAHY-MORGAN, M.C., R.A.F., second son of Mr. and Mrs. Mulcahy-Morgan, of Dundrum, Co. Dublin, was married on March 6, at St. Paul's, Knightsbridge, to BARBARA MARY, daughter of Mr. and Mrs. WALTER HEAPE, of 10, King's Bench Walk, Temple.

Lieut. HOWARD BRANSTON TROUP, R.A.F., M.S., son of Mr. and Mrs. Troup, of Kensington, was married on March 11, at St. Mary's, Bryanston Square, to ENA GRACE, second daughter of the late Wm. HOLT, and of Mrs. HOLT, of Portman Square.

To be Married

The engagement is announced between Lieut. G. E. BOYD, S.A.H. and R.A.F., son of Dr. Boyd, of South Africa, and grandson of the late Lord Provost Boyd, of Edinburgh, and VERA LILIAN, only child of Mr. and Mrs. GEORGE WARREN, of Esher, Surrey.

The marriage arranged between Maj. G. V. CAREY, R.A.F. (late Rifle Brigade), and EILA, daughter of Mr. and Mrs. G. W. REYNOLDS, of Upcote, Shepherd's Hill, Highgate, will take place very quietly on April 1.

A marriage will take place in the summer between Lieut.-Col. R. H. CLARK HALL, D.S.O., R.A.F. (commander, R.N.), son of the late John Clark Hall, Co. Derry, Ireland, Registrar-General of Shipping and Seamen, and LILLIAS, elder daughter of Col. R. ELIOTT LOCKHART, late R.H.A., and Mrs. R. ELIOTT LOCKHART, The Hewke, Lockerbie.

The engagement is announced of Capt. WILLIAM FOSTER, R.A.F., youngest son of Mr. Robert Foster, and the late Hon. Mrs. Robert Foster, of Stockeld Park, Yorkshire, and MARJORIE, only daughter of Sir ERNEST and Lady CONSTANCE HATCH, of 20, Portland Place, W. (present address, 46, Upper Grosvenor Street, W.).

A marriage has been arranged, and will shortly take place in Penang, between Maj. H. D. JENSEN, M.C., R.A.F., son of the late Mr. H. P. F. Jensen and Mrs. Jensen, of Broadwater, Worthing, and ALINE HUTCHINSON, younger daughter of Col. T. H. HAUGHTON (Indian Army, retired) and Mrs. HAUGHTON, of Chisbeach, West Worthing.

An engagement is announced between Capt. A. MANSEL LEWIS, R.A.F., youngest son of Mr. and Mrs. C. W. Mansel Lewis, of Stradey Castle, Llanelly, S. Wales, and MURIEL, second daughter of Mr. and Mrs. GRAY KNIGHT, of The Manor Cottage, Fleet, Hants.

Items

Col. W. A. BISHOP, V.C., has been satisfactorily operated upon at Roanoke, Virginia, for appendicitis.

If anyone who was with, or saw, Lt.-Col. B. O. JENKINS, C.B.E., R.A.F., during his last illness at Coblenz (?), at the end of January or during the first week of February, will communicate particulars to his parents they would be most grateful. Address—"Elsinore," Redland Green, Bristol.

The will of Maj. LESLIE PEECH AIZLEWOOD, R.A.F., of Blenheim House, Doncaster Road, Rotherham, Yorks., has been proved at £10,835.



The Government and War Inventions

THE King has been pleased to approve that the following gentlemen be appointed members of a Royal Commission to determine what awards and royalties shall be paid to inventors in respect of the use of their inventions by Government Departments during the War:—

Mr. Justice Sargant, Chairman.
Halford J. Mackinder, Esq., M.P.
Robert Young, Esq., M.P.
Professor the Hon. R. J. Strutt, F.R.S.
Sir James J. Dobbie, F.R.S.
W. Temple Franks, Esq., C.B.
G. L. Barstow, Esq., C.B.
A. C. Cole, Esq.

Military Show in the Grand Palais

THE proposal to hold an exhibition of military aircraft in France is now taking definite shape. It is to be held in the Grand Palais, and although the actual date is not finally decided, it will almost certainly be after the Art Salon and before the motor exhibition which is to be held in October.

A Competition in Italy

THE National Aerial League of Milan is organising a competition for small aeroplanes to carry light loads, specially designed for aerial touring, to be held in July at Taliedo.

Air Raids on Germany

OFFICIAL statistics published in Berlin show that 729 persons were killed and 1,754 injured in enemy aerial attacks on Germany territory since the beginning of August, 1914, down to November 8, 1918.

The damage caused in German territory by air raids during the same period is said to amount to 23,500,000 marks (about £1,700,000).

Frankfort-Berlin Aerial Mail

A TELEGRAM from Frankfort-on-Main states that an aerial post has been established between the two cities. The post is to be a daily one, and will comprise registered letters, etc. The journey will take about four hours.

A Super-Zeppelin

Le Matin reports the approaching completion by Germany of a Zeppelin with nine motors and eight propellers and the completion of a large biplane developing 3,000 h.p.

A German Giant Aeroplane

WHAT is claimed to be the largest aeroplane in the world is now undergoing trials at Döberitz. It has been built by the Siemens-Schuckert works at Berlin and will be used for passenger and commercial traffic, and there is a possibility it may attempt to fly the Atlantic. The machine is stated to be driven by six motors of 300 h.p. each, while the diameter of the propeller measures 16½ ft. One of the wings of the aeroplane has a span of 158½ ft. At present, tanks of 750 gallons capacity are fitted.

THE ROYAL AIR FORCE

London Gazette, March 7th.

Flying Branch.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—

L. A. W. Clift; March 6. substituted for notification in *Gazette* of Dec. 6, 1918. K. R. Anderson (Liverpool R.), B. F. Braithwaite (caused by wounds), H. V. Ellis, L. G. Fauvel (contracted on active service); March 8.

Sec. Lieut. H. H. Towne is antedated in his appointment as Sec. Lieut. (A.); Aug. 9, 1918.

Sec. Lieut. W. R. Allison is antedated in his appointment as Sec. Lieut. (A. and S.); May 10.

Sec. Lieut. J. L. G. Fasham is antedated in his appointment as Sec. Lieut. (K.B.); May 25, 1918.

The initials of Lieut. (actg. Capt.) D. W. Grinnell-Milne are as now described and not as in *Gazette* Nov. 1, 1918.

The surname of Lieut. W. W. Smyth is as now described, and not as in *Gazette* Feb. 14.

The surname of Sec. Lieut. W. Campbell is as now described and not as in *Gazette* Jan. 24 and Feb. 14.

The surname of Flight Cadet R. Hofmeyr is as now described, and not as in *Gazette* Nov. 12, 1918.

The notification in *Gazette*, Sept. 6, 1918, concerning Sec. Lieut. (Hon. Lieut.) J. Jackson is cancelled.

The notification in *Gazette* Jan. 17 concerning Sec. Lieut. A. L. Stephens is cancelled.

Administrative Branch.

Maj. N. S. Douglas to be Maj. (from A. and S.); Dec. 30, 1918.

C. H. Brodie (Temp. Capt., R.E.) is granted a temp. commn. as Capt.; Aug. 26, 1918, with seniority from April 1, 1918.

To be actg. Capt. whilst employed as Capt.:—Lieut. J. S. Bowler; Sept. 1, 1918. Sec. Lieut. (Hon. Maj.) S. A. Snatt; Oct. 24, 1918.

Lieut. R. Blackwood is granted the actg. rank of Capt., without pay and allowances of that rank; Oct. 19, 1918.

Capt. A. W. Kay to be graded for purposes of pay as Lieut. whilst employed as Lieut., from (A.); Jan. 29.

Lieuts. (A.) to be Lieuts.:—A. T. Laing; July 22, 1918. D. H. Robinson, D.F.C.; Oct. 30, 1918. (Actg. Capt.) J. G. Burchett, M.C.; Nov. 25, 1918, and relinquishes the actg. rank of Capt. (Hon. Capt.) (actg. Capt.) O. C. W. Johnson; Dec. 3, 1918, and relinquishes the actg. rank of Capt.; J. Ross; Dec. 6, 1918. R. K. Fletcher; Dec. 20, 1918. J. I. Ellis; Jan. 4, 1919.

A. R. Porter; Jan. 8. M. E. Gadd, H. R. Little; Jan. 9. L. G. Kesterton; Jan. 10. D. E. Morrison; Jan. 14. T. P. Keady; Jan. 17. F. E. Des Brisay; Jan. 21. W. G. Latham; Jan. 22. W. J. Wyatt; Jan. 30. D. G. Lewis; Feb. 4.

Lieut. A. V. Evans to be Lieut., from (A. and S.); Dec. 30, 1918.

Sec. Lieuts. to be Lieuts.:—L. Cable (actg. Capt.) J. G. Beckham, and to retain his actg. rank, C. A. Le Strange, C. C. Duffield; April 2, 1918. H. A. Young; April 6, 1918. W. Spink, E. R. Cox; April 25, 1918. J. W. Sawyer, G. P. Browne; April 26, 1918. D. T. McGuire; May 22, 1918.

B. A. R. Shore; May 23, 1918. J. H. Bryen; June 4, 1918. H. Salmon; June 11, 1918. O. Lawrence; June 19, 1918. T. H. Jones; July 6, 1918. T. J. Hudson; July 19, 1918. N. L. Kelly; July 25, 1918. E. C. Chapman; July 26, 1918. R. R. Byrne; Aug. 3, 1918. H. M. Eldridge, M.C.; Aug. 11, 1918. G. Wilson; Aug. 23, 1918. J. Rymer, H. V. Hall; Aug. 27, 1918.

E. O. Byam; Sept. 3, 1918. E. P. Spriggs; Sept. 9, 1918. T. H. Holmes; Sept. 20, 1918. P. J. E. Brake; Oct. 8, 1918. L. W. Park; Oct. 11, 1918. S. Saunders; Oct. 23, 1918. P. T. Bond; Nov. 13, 1918. R. S. Swanton; Nov. 19, 1918. H. E. Evennett; Dec. 2, 1918. E. A. Malcolm; Dec. 3, 1918. F. Bagot, J. Woolfenden; Jan. 1. E. R. Harris; Jan. 5. V. C. Roxmouth; Jan. 29. E. W. Pringle; Feb. 16. A. E. Houghton; Feb. 25.

Sec. Lieut. C. E. Beeson to be actg. Lieut. while employed as Lieut.; Nov. 1, 1918.

Sec. Lieuts. to be Sec. Lieuts. from (A.):—W. J. Bedworth; Sept. 10, 1918 (substituted for notification in *Gazette* Feb. 4). H. Alcock; Dec. 3, 1918. H. Dove; Jan. 13. R. S. Maitland; Jan. 21.

Sec. Lieuts. to be Sec. Lieuts. from (A. and S.):—(Hon. Lieut.) E. L. Ridley; Dec. 18, 1918, and to be Hon. Lieut.; S. H. Hughes; Feb. 3.

Sec. Lieuts. to be Sec. Lieuts. from (O.):—E. W. Reynolds; Sept. 1, 1918. E. A. Dew, D.F.C.; Nov. 14, 1918. (Hon. Lieut.) A. V. Collins; Dec. 2, 1918, and to be Hon. Lieut. M. P. Dalrymple; Dec. 5, 1918. (Hon. Lieut.) G. M. Knox; Dec. 14, 1918, and to be Hon. Lieut.; J. L. Rhys; Jan. 2. A. G. Squire; Jan. 6. G. Williams; Jan. 29. C. J. Swalbridge; Feb. 3.

Sec. Lieut. A. E. Marks (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut.; April 1, 1918.

The following Lieuts. relinquish their commns. on ceasing to be employed: W. P. Trotter (Lieut., R. Fus.); Nov. 15, 1918. J. A. B. Thompson (Lieut., Essex R.); Feb. 11. G. A. Ripley (Lieut., Dragoons, S.R.); Feb. 18.

The following are transfd. to Unemployed List:—Sec. Lieut. E. A. Taylor; Jan. 10. Sec. Lieut. A. W. M. Bryant; Jan. 18. Lieut. C. Bell, Lieut. W. E. W. Cushing; Jan. 21. Sec. Lieut. F. H. Favell; Jan. 25. Sec. Lieut. F. N. Trier; Jan. 26. Capt. C. W. Curd; Jan. 27. Sec. Lieut. A. Beattie, Sec. Lieut. G. E. Harvey, Sec. Lieut. J. W. Tough; Jan. 28. Lieut. J. Brodie, Lieut. P. C. Coote, Capt. A. Farquhar, Sec. Lieut. L. O. Ludgate; Jan. 31. Sec. Lieut. W. J. C. Finlayson; Feb. 2. Lieut. (actg. Capt.) W. Topham; Feb. 5. Lieut. F. Crossley, Lieut. E. L. Heyworth, Sec. Lieut. R. Twitchell; Feb. 7. Sec. Lieut. E. H. W. Darley; Feb. 8. Sec. Lieut. K. C. Long, Lieut. (actg. Capt.) S. Taylor; Feb. 12. Lieut. E. M. Gardiner; Feb. 14. Sec. Lieut. F. C. Howe; Feb. 15. Sec. Lieut. (actg. Lieut.) F. J. Brooks, Sec. Lieut. C. G. Gowing; Feb. 17. Sec. Lieut. H. T. Backhouse; Feb. 18. Lieut. J. H. Holland, Sec. Lieut. H. G. Lynn; Feb. 19. Capt. W. F. Egerton; Feb. 20. Sec. Lieut. W. S. Leeming; Feb. 22. Lieut. (actg. Capt.) C. H. Cornelius; Feb. 23. Sec. Lieut. A. C. Cunison; Feb. 24. Capt. H. V. Rabagliati; Feb. 26. Sec. Lieut. W. J. Tuck; March 1.

Capt. L. E. Eeman relinquishes his commn. on account of ill health, and is permitted to retain his rank; March 8.

Lieut. (Hon. Capt.) H. S. Sellicks relinquishes his common. on account of ill-health contracted on active service, and is permitted to retain the rank of Capt.; March 8.

Sec. Lieut. (actg. Lieut.) G. E. Tune relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain rank of Lieut.; March 8.

Sec. Lieut. (Hon. Lieut.) (actg. Lieut.) L. Butterfield relinquishes his commn. on account of ill-health caused by wounds; March 8.

The initials of Lieut. (actg. Capt.) L. C. Russell are as now described, and not as in *Gazette* Feb. 14.

The notification in *Gazette* Jan. 10 concerning Lieut. N. M. Smith is cancelled.

Technical Branch.

Lieut.-Col. (actg. Col.) M. Spicer to be Lieut.-Col. from (S.O.), and relinquishes actg. rank of Col.; Feb. 17.

Lieuts. to be actg. Capt. whilst employed as Capt. (Grade A.):—F. S. Bartno, A. G. D. West; Jan. 1.

Sec. Lieuts. to be actg. Capt. whilst employed as Capt. (Grade A.):—S. R. Chapman, (Hon. Lieut.) R. I. Wells; Jan. 1.

Sec. Lieut. (Hon. Lieut.) (actg. Lieut.) J. Drew to be actg. Capt. whilst employed as Capt. (Grade B); Feb. 8.

Lieut. W. R. Maunder to be graded for pay as Lieut. whilst employed as Lieut. (Grade A); Jan. 1.

Sec. Lieuts. to be Lieuts.:—Sec. Lieut. (actg. Capt.) H. M. Ayres, and to retain this actg. rank; Sec. Lieut. (Hon. Lieut.) (actg. Capt.) H. W. Wade, and to retain his actg. rank; Sec. Lieut. (Hon. Lieut.) (actg. Capt.) D. M. Mackie, and to retain his actg. rank; April 2, 1918. Sec. Lieut. (actg. Lieut.) D. J. Parry; Aug. 16, 1918. Sec. Lieut. (actg. Lieut.) D. Mitchell; Sept. 3, 1918. Sec. Lieut. (actg. Capt.) G. Adams, and to retain his actg. rank; Nov. 6, 1918. Sec. Lieut. (actg. Capt.) L. E. Carter, and to retain his actg. rank; Nov. 20, 1918. Sec. Lieut. (actg. Lieut.) S. H. Reynolds; Jan. 1.

Sec. Lieuts. to be Lieuts. (without pay and allowances of that rank):—A. W. R. Trusler, J. E. Good, V. P. Spurway, H. A. P. Bale, F. Alexander, F. H. Jones, D. S. Parsons, M. A. Doyle, W. F. Simpson, Sec. Lieut. (Hon. Capt.) H. W. Clarke, and to retain his hon. rank; J. H. Ward, G. R. Simms, J. H. M. Stevenson, A. D. Robertson, C. A. H. Mason, F. E. Smyth, E. W. S. Jacobi, (Hon. Capt.) W. H. Stronge, and to retain his hon. rank; J. Rimmer, T. B. Jones, (Hon. Capt.) F. Campbell, and to retain his hon. rank; C. D. Neale, A. Dobner, A. Bushfield, E. W. Mann; April 2, 1918. C. L. Gandy; April 4, 1918. A. R. Mitchell, F. G. Buck; April 5, 1918. T. C. Holleyman; June 1, 1918. J. Y. Watson, A. D. Birkhead, B. E. Harris; June 8, 1918. C. D. De Pinner; June 29, 1918. H. G. Cook, D.S.M.; July 18, 1918. J. O. Clover; Aug. 9, 1918. H. Linfield; Aug. 11, 1918. C. J. Couchman; Aug. 16, 1918. P. L. Smith; Aug. 27, 1918. A. H. Hughes; Sept. 1, 1918. F. A. Worlidge; Sept. 9, 1918. F. A. Ormerod; Sept. 28, 1918. W. Randall; Sept. 29, 1918. A. H. Desforges; Oct. 5, 1918. H. S. Graves; Oct. 26, 1918. A. H. Bull; Nov. 8, 1918. W. F. Wood; Nov. 9, 1918. J. V. Yates; Nov. 17, 1918. W. J. Rice; Dec. 1, 1918. C. F. Soans; Dec. 20, 1918. P. E. Dorte, A. W. Cordrey, T. S. Nash; Dec. 30, 1918. C. P. W. Jolliffe; H. S. G. Jamieson, P. J. McChesney; Jan. 1. H. L. Doherty; Jan. 5. A. Gough, D. W. Harvey; Jan. 16. W. H. Spargo; Jan. 21. T. I. Grimes; Jan. 27. W. W. Bull; Feb. 4. H. G. Baker; Feb. 7. O. Fielding-Clark, F. Clarke; Feb. 13. M. H. Armstrong; Feb. 15. D. A. Campbell; Feb. 20. J. W. McKee; Feb. 22. A. Honey, A. Heywood, J. E. Adcock, F. G. Murray, S. G. Hurley, T. M. F. Tambllyn-Watts, G. H. Rice, C. R. Evans; Feb. 24. R. R. Crosby; Feb. 27. S. T. Kemp; Feb. 28.

Sec. Lieuts. to be actg. Lieuts. whilst employed as Lieuts. (Grade A):—R. T. B. Wynn; June 1, 1918. A. Marr, S. G. Newport; Jan. 1.

Sec. Lieuts. to be actg. Lieuts. whilst employed as Lieuts. (Grade B):—J. W. Davis, W. H. Fearnside; Sept. 1.

Sec. Lieut. P. Christopherson to be Sec. Lieut. (Grade B) from (Ad.); Feb. 27.

Sec. Lieut. W. S. Hay (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. (Grade A); Sept. 1, 1918.

The following Cadets are granted temp. commns. as Sec. Lieuts. (Grade B):—30678 P. Collins; Aug. 27, 1918 (substituted for notification in *Gazette* Dec. 17, 1918). 1893 A. L. Parry; Oct. 24, 1918 (substituted for notification in *Gazette* Feb. 21).

The following are transfd. to Unemployed List:—Capt. H. Burgess; Jan. 18. Sec. Lieut. N. B. Brown, Lieut. A. J. Evans; Jan. 21. Capt. H. B. R. Rowell; Jan. 24. Sec. Lieut. A. M. Watters; Jan. 28. Sec. Lieut. B. Thelenberg; Jan. 31. Sec. Lieut. (actg. Capt.) C. H. Quelch; Feb. 1. Capt. A. B. Spencer; Feb. 3. Sec. Lieut. W. H. Johnson, Sec. Lieut. R. D. Thompson; Feb. 7. Sec. Lieut. A. H. M. Jacoby; Feb. 11. Lieut. G. G. Kitson; Feb. 15. Sec. Lieut. G. W. Barber, Capt. L. Davies, Capt. S. T. Frapp; Feb. 18. Sec. Lieut. J. G. Beavers, Sec. Lieut. L. C. G. Gemson, Sec. Lieut. (Hon. Lieut.) V. L. Henwood, Lieut. C. V. Thornton; Feb. 19. Lieut. (actg. Capt.) C. E. Welsh; Feb. 20. Capt. R. P. Castle, Lieut. G. N. Cockerell, Lieut. A. E. Read; Feb. 21. Sec. Lieut. W. E. Garden, Sec. Lieut. H. W. Halifax; Feb. 22. Sec. Lieut. A. S. Crosby, Capt. G. I. N. Deane, Lieut. R. Rochford; Feb. 23. Capt. H. F. Alton; Feb. 25.

Lieut. J. H. Grills relinquishes his commn. on account of ill-health, and is permitted to retain his rank; March 8.

The initials of Lieut. (actg. Capt.) F. M. Howard are as now described, and not as in *Gazette* Feb. 14.

Medical Branch.

Lieut. O. Hilton is transfd. to Unemployed List; Feb. 19.

Dental Branch.

Capt. G. Dawson is transfd. to Unemployed List; Feb. 8.

Memoranda.

Capt. L. Crooks to be actg. Maj. whilst holding a special appointment at the Ministry of Munitions; Jan. 21.

Sec. Lieuts. to be Lieuts.:—(Actg. Capt.) J. W. Jones, and to retain his actg. rank; April 2, 1918. (Actg. Capt.) D. C. Sutherland, and to retain his actg. rank; May 5, 1918. (Actg. Capt.) B. B. Johnson, and to retain his actg. rank; Aug. 9, 1918. (Actg. Capt.) A. Holmes, and to retain his actg. rank; Sept. 5, 1918. A. G. O. Ellis; Dec. 1, 1918. (Actg. Capt.) C. A. Perry, and to retain his actg. rank; Dec. 11, 1918. (Actg. Capt.) W. Lienard M.B.E., and to retain his actg. rank; Feb. 24, 1918.

Col. R. W. Glennie, C.M.G. (Capt., R.N.), relinquishes his commn. on ceasing to be employed; Jan. 15.

The following are transfd. to Unemployed List from (S.O.):—Sec. Lieut. (actg. Lieut.) H. F. Robertson; Jan. 16. Maj. C. E. Gardner; Feb. 3. Capt. (actg. Maj.) W. W. Higgin; Feb. 4. Capt. (actg. Maj.) T. P. Searight; Feb. 5. Maj. (actg. Lieut.-Col.) D. H. Cameron, O.B.E.; Feb. 11. Capt. A. W. Dods; Feb. 14. Capt. (actg. Maj.) E. H. C. Bald, M.C.; Feb. 17. Sec. Lieut. (actg. Capt.) B. B. Johnston; Feb. 22.

London Gazette, March 11.

The following temporary appointment is made at the Air Ministry:—

Director of Air Personal Services.—Col. (actg. Brig.-Genl.) F. L. Festing, C.M.G., and to retain his actg. rank whilst so employed, from Nov. 25, 1918, to Jan. 13.

Flying Branch.

Maj. E. Dalziel to be Maj. (K.B.), from (T.); May 6.

Capt. R. Grey to be Maj.; April 1, 1918, but not to carry pay and allowances prior to Jan. 14.

Capt. S. T. L. Greer, A.F.C., to be actg. Maj. whilst employed as Maj. (A.); Sept. 1, 1918.

Capt. to be actg. Maj. whilst employed as Maj. (A. and S.).—C. J. C. Clayton, D.F.C.; Oct. 1, 1918. A. T. Barker, D.F.C.; Nov. 1, 1918. Capt. J. L. Gordon, D.F.C., to be actg. Maj. whilst employed as Maj. (S.); Oct. 1, 1918.

Lieut. H. W. Chattaway to be actg. Capt. whilst employed as Capt. (A.); Dec. 1, 1918.

Lieut. A. S. Hartley to be Lieut. (A.) from (O.); Oct. 29, 1918.

Sec. Lieut. L. G. Smith (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. (A.); Aug. 5, 1918 (since killed).

Sec. Lieut. F. I. Livingstone (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. (Obs. Officer); Sept. 30, 1918.

The following relinquish their commns. on ceasing to be employed:—Lieut. S. L. Dowswell (Lieut., Manitoba R.); Jan. 11. Sec. Lieut. G. F. Watson (Sec. Lieut., City Lond. R., T.F.); Feb. 8. Lieut. (actg. Capt.) T. C. Creaghan (Lieut., W. Ont. R.); Feb. 10. Sec. Lieut. (Hon. Lieut.) R. J. Mesney (Lieut., R. War. R., S.R.); Feb. 21. Sec. Lieut. J. McIntyre (Sec. Lieut., E. Yorks. R.); Feb. 22.

The following are transf'd. to Unemployed List:—Lieut. H. D. Arkell; Jan. 14. Lieut. R. A. Carter, Sec. Lieut. G. D. Scott; Jan. 15. Sec. Lieut. B. E. Sadler; Jan. 16. Lieut. H. E. F. Russell; Jan. 17. Sec. Lieut. A. W. Elliott; Jan. 18. Lieut. W. Franklin; Jan. 20. Lieut. A. N. Barlow, Lieut. J. C. Grant, Sec. Lieut. G. M. Hughey; Jan. 24. Lieut. H. S. Davison (Suff. R., T.F.), Lieut. W. Dix, Lieut. D. O. Thomas, Lieut. W. H. Thomas; Jan. 25. Lieut. A. J. J. O'Farrell (E. Lancs. R., T.F.), Lieut. A. G. Raven, Lieut. H. W. Riding, Lieut. (actg. Capt.) W. Selwyn; Jan. 28. Sec. Lieut. H. R. Sturgess, Sec. Lieut. G. R. Stark; Jan. 29. Capt. S. Turner; Jan. 30. Sec. Lieut. J. Davidson; Jan. 31. Sec. Lieut. S. A. Bird, Sec. Lieut. F. F. McKilligan; Feb. 1. Lieut. H. S. Baldwin (Worc. R., T.F.), Lieut. J. H. Inskip, Lieut. B. Reading, Lieut. R. A. Thomas; Feb. 2. Sec. Lieut. J. H. Bradbury, Sec. Lieut. F. D. Genniloud, Lieut. J. W. Gillespie, Lieut. T. E. A. Griffith; Feb. 4. Lieut. H. Arkell, Lieut. E. S. Grinstead, Sec. Lieut. T. Robson, Lieut. J. K. Tullis; Feb. 5. Lieut. J. N. Hawthorne; Feb. 6. Sec. Lieut. R. H. Baker; Feb. 7. Lieut. W. Casson; Feb. 8. Sec. Lieut. J. W. R. McPhail; Feb. 10. Lieut. G. M. Clark, Lieut. S. K. Isaac, Capt. J. H. Keens, Sec. Lieut. T. T. Warriner, Lieut. H. S. Whitby; Feb. 11. Lieut. W. Green (E. Yorks. R.), Sec. Lieut. (Hon. Lieut.) B. Lockett (Lieut., K. L'pool R., T.F.), Sec. Lieut. K. L. Rogers; Feb. 12. Sec. Lieut. F. T. Arnold, Sec. Lieut. L. R. Blacking, Sec. Lieut. E. Hardcastle, D.F.C.; Feb. 13. Sec. Lieut. A. C. Beard (H.L.I., T.F.), Sec. Lieut. W. G. Davis, Sec. Lieut. L. Edwards, M.C., Lieut. R. G. Hart, M.C.; Feb. 14. Sec. Lieut. R. Bennett, Lieut. E. C. Coops, Sec. Lieut. A. W. N. Evans, Lieut. M. O. Fairhurst, Lieut. A. T. Hopwood, Sec. Lieut. S. V. Spiller, Lieut. F. R. P. Williams, Lieut. E. H. Wilford, Sec. Lieut. T. Warburton, Lieut. J. W. Willett; Feb. 15. Lieut. A. J. Ferrier (Shrop. L.I.), Sec. Lieut. (Hon. Lieut.) J. G. Hadden (Lieut., R. Scots Fus., T.F.), Sec. Lieut. S. Hodges, Sec. Lieut. J. L. Irving; Feb. 16. Sec. Lieut. H. W. Goldsack; Feb. 17. Lieut. D. C. S. Bland, Sec. Lieut. H. Bulie, Lieut. T. E. Chimes, Sec. Lieut. A. Cooper, Sec. Lieut. A. R. Giroux, Sec. Lieut. S. J. Henley, Lieut. L. C. Jordan, Capt. C. R. Vaughan; Feb. 18. Sec. Lieut. H. S. Colls, Sec. Lieut. K. L'E. Davey, Maj. J. O. Davis, M.C. (R.E., T.F.), Capt. J. Day, M.C. Sec. Lieut. H. E. Froy, Lieut. R. W. Griggs, Sec. Lieut. N. H. Haylock, Sec. Lieut. O. G. Meredith, Lieut. L. B. Moor, Sec. Lieut. L. L. Nelson, Sec. Lieut. H. Noble, Capt. G. Preen, Capt. (actg. Maj.) J. B. Solomon, Lieut. F. A. Whittall; Feb. 19. Lieut. C. F. Briggs (R.W. Surr. R.), Lieut. O. C. Cassels, Lieut. R. F. Connack, Lieut. V. F. S. Duntun, Sec. Lieut. J. M. Evans, Sec. Lieut. R. J. Eve, Capt. L. R. Evershed, Sec. Lieut. A. F. Honeysett, Sec. Lieut. D. A. Jones (R. Welsh Fus., T.F.), Lieut. J. H. McCann (E. York. R., T.F.), Sec. Lieut. P. F. Mitchell, Sec. Lieut. J. D. Podmore, Sec. Lieut. W. A. Westacott, Sec. Lieut. E. L. Wynn; Feb. 20. Lieut. F. Berry, Lieut. T. O. Davis, Lieut. W. A. B. Eastwood, Sec. Lieut. T. Elliott, Lieut. F. N. Finch, Sec. Lieut. W. Holmes, Sec. Lieut. C. J. Mitchell, Sec. Lieut. C. S. Muir; Feb. 21. Lieut. W. I. Caven, Lieut. H. E. R. Finch, Lieut. F. D. Levey (Lieut., Lond. R., T.F.), Sec. Lieut. G. Lindsay, Sec. Lieut. A. Stephens, Sec. Lieut. E. A. Sewell, Lieut. E. H. Umbers, Lieut. W. O. B. Winkler (R.G.A.); Feb. 22. Lieut. L. E. Evans, Lieut. H. J. Jewell, Sec. Lieut. L. F. Marshall, Sec. Lieut. D. L. Murchison, Sec. Lieut. M. E. Smith, Lieut. (actg. Capt.) D. Sutherland; Feb. 22. Sec. Lieut. F. S. Gregson; Feb. 24. Sec. Lieut. A. T. Barker, M.C. (K. Liverpool R., T.F.), Lieut. (Hon. Capt.) L. I. Collins, Lieut. E. L. Darneley, Sec. Lieut. F. P. Dodsworth, Sec. Lieut. L. Eastwood, Sec. Lieut. (Hon. Capt.) G. E. Haworth (Capt., Ches. R., T.F.), Sec. Lieut. G. E. Stevens, Lieut. E. H. Ward; Feb. 25. Sec. Lieut. W. Barlow, Sec. Lieut. A. E. T. Bruce, Sec. Lieut. L. Crowther, Sec. Lieut. G. F. Dupuy, Sec. Lieut. G. A. Fraser; Feb. 26. Lieut. (actg. Capt.) F. T. Bright, Lieut. A. N. David; Feb. 27. Sec. Lieut. E. W. Bragg, Sec. Lieut. T. W. Hart; Feb. 28. Lieut. B. G. Beardall, Lieut. (actg. Capt.) H. Cubitt, Sec. Lieut. J. E. Kemp, Lieut.-Col. (actg. Brig.-Gen.) C. F. Lee (Capt., W. Som. Yeo., T.F.); March 1. Lieut. G. C. B. Cotterell; March 4. Capt. W. B. Elliott, D.F.C.; March 12. Capt. A. J. Brown, M.C., relinquishes his commn. on account of ill-health and is permitted to retain his rank; March 12.

The following Lieuts. relinquish their commns. on account of ill-health and are permitted to retain their rank:—G. L. Barritt (Lincs. R., T.F.) (contracted on active service), R. Fletcher, L. Lucas (contracted on active service); March 12.

The following Lieuts. relinquish their commns. on account of ill-health:—L. S. Gray (caused by wounds); Feb. 15 (substituted for notification in *Gazette* Feb. 14. C. Geen (Lond. R.); March 12.

The following Sec. Lieuts. relinquish their commns. on account of ill-health and are permitted to retain their rank:—H. H. Bland, J. W. Whitmarsh (contracted on active service); March 12.

The following resign their commns.:—Sec. Lieut. R. Cockburn; Feb. 1 (substituted for notification in *Gazette* Jan. 31). Lieut. R. Q. Thomas; March 12.

The surname of Sec. Lieut. B. P. Jenkins is as now described, and not as stated in *Gazette* July 19, 1918.

The initials and surname of Sec. Lieut. J. O. Taylor are as now described and not J. Ostram-Taylor as stated in *Gazette*, July 5, 1918.

The number of Flight Cadet J. Stephens is 2364, and not 178060 as stated in *Gazette* Nov. 22, 1918.

The surname of Lieut. (actg. Capt.) R. D. Caley is as now described, and not as stated in *Gazette* July 23, 1918.

The notification in *Gazette*, Jan. 28, concerning Lieut. A. W. Sharp, is cancelled.

Administrative Branch.

Capt. C. H. C. Woollven to be Capt., from (A.); Jan. 20. A. MacKenzie (Temp. Lieut., High. L.I.) is granted a temp. commn. as Lieut., with seniority from April 1, 1918, and to be actg. Capt. while employed as Capt.; Nov. 9, 1918.

Lieut. J. E. Arnot to be actg. Capt. while employed as Capt.; Jan. 8.

Capt. F. A. Coward to be Lieut. (Hon. Capt.) from (A.); Nov. 29, 1918.

Lieuts. (A.) to be Lieuts.:—B. N. Willis; Nov. 6, 1918. E. P. Pycroft; Nov. 14, 1918. J. Adam; Dec. 10, 1918. E. P. Watso; Dec. 15, 1919.

N. H. Kemp; Dec. 16, 1918. C. D. Bremner; Dec. 19, 1918. A. S. Harris; Jan. 2. N. C. Bennisson, H. T. Kemp; Feb. 3.

Lieut. D. W. Macintosh to be Lieut., from (O.); Nov. 19, 1918.

Sec. Lieuts. to be actg. Lieuts. while employed as Lieuts.:—W. R. Casting;

July 1, 1918. (Hon. Lieut.) A. Nash; Sept. 21, 1918. W. J. Scarff; Dec. 1, 1918.

Sec. Lieut. C. H. Strong (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut.; June 24, 1918.

Sec. Lieuts. to be Sec. Lieuts., from (A.):—E. Anderson; Nov. 15, 1918. J. F. Kinlock; Jan. 2. R. S. Walter; Jan. 6. C. W. Sutcliffe; Jan. 14.

A. N. Jones; Jan. 22. R. C. Rogers, J. R. Sleight; Jan. 29.

Sec. Lieut. F. W. McClive to be Sec. Lieut., from (A. and S.); Jan. 14.

Sec. Lieuts. to be Sec. Lieuts., from (O.):—D. O. Davies; Aug. 28, 1918. J. F. J. Peters; Jan. 16. W. E. de Turberville; Jan. 17. T. J. Calnan; Jan. 22. R. R. Parker; Feb. 1. F. C. Peacock, M.C.; Feb. 17.

Sec. Lieuts. to be Sec. Lieuts., from (O.):—(Substituted for notification in *Gazette* March 4).—C. M. McGorrrery (and to be Hon. Lieut.), W. J. Bradshaw; Dec. 18, 1918.

The following relinquish their commns. on ceasing to be employed:—Sec. Lieut. (Hon. Capt.) H. Wright; Dec. 12, 1918. Lieut. W. J. T. Wright (Lieut., Can. Ry. Ser.); Jan. 13.

The following are transf'd. to Unemployed List:—Sec. Lieut. C. Rolfe; Jan. 24. Sec. Lieut. W. A. Scott; Jan. 25. Lieut. F. W. Irving; Jan. 26.

Sec. Lieut. W. G. Galloway, Sec. Lieut. D. T. Stewart; Jan. 28. Lieut. R. J. Thomas; Feb. 4. Sec. Lieut. (Hon. Lieut.) S. G. Lewis, Sec. Lieut. J. D. Smithie; Feb. 6. Lieut. W. Brackenbury, Sec. Lieut. H. R. Hardcastle; Feb. 8. Lieut. A. J. M. Fairbairn, Capt. C. F. Garrard; Feb. 11.

Lieut. (actg. Capt.) T. E. Mills; Feb. 13. Sec. Lieut. G. H. Beattie; Feb. 15. Lieut. E. L. Davies; Feb. 16. Capt. P. B. Anderton, Lieut. A. A. Frew, Lieut. R. H. M. Park, M.C.; Feb. 18. Lieut. F. J. Martin; Feb. 19. Lieut. M. J. Dalton, Sec. Lieut. C. McPherson, Sec. Lieut. G. E. A. Royle; Feb. 20.

Lieut. (Hon. Capt.) (actg. Maj.) R. E. C. Bruce-Knight; Feb. 23. Sec. Lieut. A. L. Horrell; Feb. 24. Lieut. (actg. Capt.) G. W. Beor, Sec. Lieut. S. S. Tremayne; Feb. 26. Lieut. V. H. Hughes; Feb. 28. Capt. G. G. Braithwaite; March 1.

Sec. Lieut. I. C. Bannister (24209) relinquishes his commn. on account of ill-health, and is permitted to retain his rank; March 12.

The notification in *Gazette* Jan. 21 concerning Lieut. W. G. Stevenson, D.F.C., is cancelled.

The notification in *Gazette* Feb. 18 concerning Sec. Lieut. S. R. S. Burnett is cancelled.

Technical Branch.

Sec. Lieut. W. G. Kentfield to be actg. Capt. while employed as Capt. (Grade A); July 1, 1918.

Sec. Lieuts. to be actg. Capt. while employed as Capt.:—J. R. Coulthard; Jan. 1 (substituted for notification in *Gazette*, Jan. 24). W. A. Fowler; March 1.

Lieut. F. D. C. Gaiger to be Lieut. (Grade A) from (O.); Aug. 13, 1918.

Sec. Lieut. H. J. Adkins to be actg. Lieut. while employed as Lieut. (Grade A.); June 1, 1918.

Sec. Lieuts. to be Sec. Lieuts. (Grade A.), from (Ad.):—A. Milne; Nov. 10, 1918. E. W. Barton; Nov. 24, 1918. A. G. S. Lyford; Dec. 18, 1918.

A. J. Penultima; Dec. 24, 1918.

Sec. Lieut. G. G. C. Piggott to be Sec. Lieut. (Grade B), from (Ad.); Sept. 16, 1918.

The following are transf'd. to Unemployed List:—Sec. Lieut. (Hon. Lieut.) J. Butcher, Lieut. J. H. Thomas; Jan. 14. Maj. J. W. Collinson; Jan. 15. Lieut. (actg. Capt.) H. C. Gaze; Jan. 16. Lieut. L. M. Hughes; Jan. 25.

Capt. W. Douglas, Lieut. A. Firth, Sec. Lieut. (actg. Lieut.) A. B. Taylor; Jan. 27. Lieut. R. Elcock, Sec. Lieut. W. Teer; Jan. 28. Capt. V. F. Bartlett; Feb. 1. Sec. Lieut. H. Hayter, Lieut. W. J. Harcourt-Hunter; Feb. 4. Lieut. W. G. Dixon; Feb. 6. Lieut. L. R. W. Loyd; Feb. 8.

Capt. R. G. B. Bird; Feb. 10. Capt. G. E. W. Broade, Sec. Lieut. J. S. Burt; Feb. 13. Lieut. E. T. Driver; Feb. 14. Sec. Lieut. F. M. Burr, Maj. A. T. Evans; Feb. 15. Sec. Lieut. (Hon. Lieut.) A. T. Brogden, Lieut. H. M. Franklin; Feb. 16. Sec. Lieut. A. J. Bird; Feb. 17. Capt. F. Crompton; Feb. 18. Sec. Lieut. (actg. Lieut.) S. H. Hewett, Lieut. A. W. Isherwood; Feb. 18. A. de V. Robertson; Feb. 19. Sec. Lieut. (actg. Lieut.) W. J. Ley, Lieut. J. A. Pritchard; Feb. 20. Capt. P. L. Hunting, Capt. A. Williams; Feb. 21. Sec. Lieut. W. J. Hollis; Feb. 22. Sec. Lieut. T. H. Baxter, Sec. Lieut. (Hon. Lieut.) D. C. N. Cook, Lieut. F. J. C. Exton, Sec. Lieut. F. V. Ruston; Feb. 23. Capt. W. R. Flint, Lieut. G. Kitchin; Feb. 25.

Lieut. W. T. Close, Sec. Lieut. H. C. A. Coggs; Feb. 26. Capt. A. F. Hamby; Feb. 27. Sec. Lieut. H. S. Cann; March 1. Maj. F. R. E. Davies, O.B.E.; March 4.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—W. J. King, N. S. Stevenson-Moore; March 12.

The notification in *Gazette* of Dec. 24, 1918, concerning Sec. Lieut. A. H. Mitchell is cancelled.

Memoranda

The date of appointment of Col. (actg. Brig.-Gen.) F. L. Festing, C.M.G., as Deputy Master-General of Personnel, is Jan. 14, and not as stated in *Gazette* of Dec. 6, 1918.

The date of appointment of Lieut.-Col. (actg. Brig.-Gen.) R. H. More, C.M.G., as Director of Air Personal Services is Jan. 14, and not as stated in *Gazette* of Dec. 6, 1918.

Lieut. W. B. South is granted the actg. rank of Capt. (without pay and allowances of that rank); March 11.

Lieuts. to be Hon. Capt.:—E. W. Crosbie, A. A. Goodman.

The following are transf'd. to Unemployed List from (S.O.):—Capt. C. H. Simpson; Jan. 22. Capt. (actg. Maj.) G. K. MacDonald; Jan. 29. Capt. (actg. Lieut.-Col.) H. G. Gold; Feb. 21. Lieut. (actg. Maj.) F. M. Iredale M.B.E.; March 1.

The notification in *Gazette* Jan. 3 concerning Capt. J. H. Woolner, A.F.C., is cancelled.

London Gazette, March 14

The following temporary appointments are made at the Air Ministry:—

Deputy Director.—Maj. (actg. Lieut.-Col.) E. G. Mackenzie, and to be actg. Col. whilst so employed; Feb. 16.

Staff Officers, 1st Class.—And to be actg. Lieut.-Cols. whilst so employed, if not already holding that rank:—(P.) Maj. (actg. Lieut.-Col.) J. M. Boyd; Feb. 1. Capt. (actg. Maj.) W. B. Adams; Feb. 16.

Staff Officers, 3rd Class.—(P.) Lieut. R. A. Toller, and to be actg. Capt. whilst so employed; Jan. 31. Capt. G. Aste; Feb. 13.

The following temporary appointments are made:—

Staff Officers, 1st Class.—And to be actg. Lieut.-Cols. whilst so employed (Air).—Capt. (actg. Maj.) J. Rubie, O.B.E., Maj. G. H. Thomson; Oct. 18, 1918.

Staff Officer, 2nd Class (P.).—Capt. J. M. Mitchell, M.B.E., and to be actg. Maj. whilst so employed; Oct. 18, 1918.

Staff Officer, 3rd Class (P.).—Lieut. (Hon. Capt.) P. V. G. Van der Byl, M.C., and to be actg. Capt. whilst so employed; March 3.

The date of appointment of Lieut. (actg. Capt.) A. Graham is July 10, 1918, and not as stated in *Gazette* July 10, 1918.

The date of appointment of Lieut. (actg. Capt.) G. W. Rogers is Dec. 1, 1918, and not as stated in *Gazette* of Feb. 7.

SIDE-WINDS

"THE Very Thing." With those words we greeted the receipt the other day from Messrs. Brown Brothers, Ltd., of Great Eastern Street, E.C. 2, of a really practical glass pin-tray. "The very thing" to stop the straying of pins all over one's desk. So we tender our thanks to Messrs. Brown Brothers.

MR. ALEXANDER JOHNSTON, J.P., general manager of the North British Rubber Co., Ltd., has, we hear, joined the board of the company as managing director. This famous old company is one of those concerns which does not generally have a managing director, and the only previous holder of the position was Mr. William Erskine Bartlett, the inventor of the beaded-edge tyre. Mr. Johnston has filled all the principal official positions of the company during the last fourteen years, having been secretary, works manager and general manager successively.

IN the *Ascol News*, dated March 13 last, was a riotously funny sketch by Mr. Douglas W. Thorburn, entitled "The Downfall of Sherlock Holmes." The great criminologist loses very little of his pristine fascination in Mr. Thorburn's hands, although—if it is not unfair to give away the end of the story—Sherlock confesses himself unable to be of service in a crisis which has beaten Mr. George H. Mansfield. AUTO. readers who have not seen the *Ascol News* should make a point of doing so. It is just as good reading for the motorist as for the accessory-seeking motor trader.

THE Whitfield Aviation Co., Ltd., are now installed in their new factory, Friars Lane, Richmond, Surrey, to which all correspondence should be addressed in future. The factory, counting-house, stores and dispatch departments have been transplanted to the new premises; only the sales department will remain at 10, Dane Street, High Holborn, London, W.C. 1.

By obtaining the Austin Motor Co.'s contract for lighting and starting sets, Messrs. C. A. Vandervell and Co., Ltd., have secured one of the most keenly competed for orders in the trade, and the Acton firm is to be congratulated on having their equipment standardised on the cars of this famous British firm.

MR. D. LAWRENCE SANTONI, who has taken such a prominent part in the organisation of Italian aeronautics during the War and been responsible for the creation of the numerous factories associated with the "Savoia" concern, has recently been in England, on account of the great reduction of aviation work which has lately taken place. Mr. Santoni, who has already transformed part of his factories to undertake new work, has decided to close down the "Savoia" aeroplane and engine factory, and is prepared to negotiate the disposal of these considerable plants equipped with most up-to-date machinery for wood and mechanical work construction with engineering firms desirous of starting manufacturing in Italy. The "Savoia" hydroplane works, which have hitherto produced some of the best-known types of flying-boats, will continue as hitherto. Mr. Santoni would also be prepared to negotiate any arrangement with British aviation companies which may prove of reciprocal advantage. Any communications for Mr. Santoni may be sent to him at the London offices of the "Savoia" Co., The British and General Aviation Contractors, Ltd., Lennox House, Howard Street, Strand, W.C. 2.

THE recent announcement that the first aerial traffic manager has just been appointed is, we understand, hardly correct. Mr. Holt Thomas's company, Aircraft Transport and Travel, has had the services of Mr. A. S. Baxendale, late manager of the Pacific Cable Board, etc., at its disposal for some time, and for a period of several months Mr. Baxendale has been investigating details and making arrangements generally. Mr. Baxendale has specially devoted himself to considerations affecting the carriage of mails and passengers. His experience is a long one. He commenced his career with the Eastern and Eastern Extension Telegraph companies, and was responsible later for the organisation of the postal and telegraph departments of the Federated Malay States. He gave expert evidence before the Committee appointed to advise on the laying (as a Government enterprise) of the All-Red Pacific cable. He was responsible for the overhaul last year of the Peruvian Telegraph Service. Mr. Baxendale is, therefore, well equipped for examining into aerial mail services—apart from technical flying matters.

IMPORTS AND EXPORTS, 1918-1919.

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; and for 1918, see "FLIGHT" for January 16, 1919.

	Imports.		Exports.		Re-exportation.	
	1918.	1919.	1918.	1919.	1918.	1919.
January ...	£ 49,402	£ 555,989	£ 24,765	£ 57,571	—	—
February	£ 51,941	£ 453,822	£ 13,545	£ 57,972	—	—
	101,343	1,009,811	38,310	115,543	—	—

NEW COMPANIES REGISTERED

J. M. KENNEDY, LTD., 118, Victoria Street, S.W.—Capital £10,000, in £1 shares. Agents, engineers, manufacturers of and dealers in aircraft, automobiles, etc. First directors: W. J. Paine, F. King.

SHERWOOD OPTICAL CO., LTD., 4, Charles Street, Hatton Garden, E.C.—Capital £5,000, in £1 shares (2,000 6 per cent. cumulative preference). Manufacturers of optical machinery and tools, aeronautical, photographic, scientific instruments, etc.

Aeronautical Patents Published

Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m = motors.

APPLIED FOR IN 1917

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published March 20, 1919
16,905. J. S. WHITE AND Co. and J. H. BROWN. Fuel valves for I.C. engines. (123,345.)

APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published March 20, 1919
2,787. S. E. SAUNDERS. Hollow wooden struts, spars, etc. (123,374.)
5,408. H. MARKHAM-MILLS. Inclometers. (123,438.)
8,604. W. G. WISE. Automatic angle of inclination indicator, both horizontal and vertical. (123,466.)

Index and Title Page for Vol. X.

The 8-page Index for Vol. X of "FLIGHT" (January to December, 1918) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 8d. per copy, post free.

NOTICE TO ADVERTISERS

IN order that "FLIGHT" may continue to be published at the usual time, it is now necessary to close for Press earlier. All Advertisement Copy and Blocks must be delivered at the Offices of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, not later than 12 o'clock on Saturday in each week for the following week's issue.

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages lv, lvi, lvii and lviii).

FLIGHT

and The Aircraft Engineer,

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.

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